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Procedures for Emission Inventory Preparation
Volume II: Point Sources

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Procedures for Emission Inventory Preparation

Volume II: Point Sources

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16. ABSTRACT

Procedures are described for compiling the complete comprehensive emission inventory of the criteria pollutants and pollutant sources. These procedures described are for use in the air quality management programs of state and local air pollution control agencies.

Basic emission inventory elements--planning, data collection, emission estimates, inventory file formatting, reporting and maintenance--are described. Prescribed methods are presented; optional methods are provided. The procedures are presented in five (5) volumes:

Volume I, Emission Inventory Fundamentals
Volume II, Point Sources
Volume III, Area Sources
Volume IV, Mobile Sources
Volume V, Bibliography

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NOTICE

The Procedures for Emission Inventory Preparation consists of these five volumes.

Volume I - Emission Inventory Fundamentals
Volume II - Point Sources
Volume III - Area Sources
Volume IV - Mobile Sources
Volume V - Bibliography

They are intended to present emission inventory procedures and techniques applicable in State and local air programs, and for contractors and other selected users. The object is to provide the best available and "state of the art" information. For some areas, however, the available source information and data either may allow more precise procedures and more accurate estimation of emissions or may not be amenable to the use of these procedures. Therefore, the user is asked to share his knowledge and experience by providing comments, successfully applied alternative methods or other emission inventory information useful to other users of these volumes. Please forward comments to the U.S. Environmental Protection Agency, Air Management Technology Branch, (MD-14), Research Triangle Park, NC 27711. Such responses will provide guidance for revisions and supplements to these volumes.

Other U.S. EPA emission inventory procedures publications:

Procedures for the Preparation of Emission Inventories for Volatile Organic Compounds, Volume I, Second Edition, EPA-450/2-77-028, U.S. Environmental Protection Agency, Research Triangle Park, NC, September 1980.

Procedures for the Preparation of Emission Inventories of Volatile Organic Compounds, Volume II: Emission Inventory Requirements for Photochemical Air Quality Simulation Models, EPA-450/4-79-018, U.S. Environmental Protection Agency, Research Triangle Park, NC, September 1979.

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Procedures for Emission Inventory Preparation

Volume II: Point Sources

by

Monitoring and Data Analysis Division
Office of Air Quality Planning and Standards

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air, Noise and Radiation
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1.0 INTRODUCTION

This volume is the second of a multivolume series designed to assist state and local air pollution agencies in preparing emission inventories of air pollutants. The emission inventory procedures presented in this volume are specific to point sources. Volume I presents a review of the fundamentals of preparing an emission inventory of point, area and mobile sources; Volumes III and IV pertain specifically to inventorying area and mobile source emissions, respectively; and Volume V is a bibliography of pertinent emission inventory literature.[1-4]

An inventory of point source emissions should provide a comprehensive, accurate and current accounting of air pollutants released to the atmosphere by specific stationary facilities/plants/activities. Emissions from stationary sources not included in the point source inventory must be accounted for in the inventory of area sources. Emissions from point and area sources, together with those from mobile sources, comprise the total inventory of emissions and provide the foundation for agency actions aimed at maintaining or improving ambient air quality.

Under ideal circumstances all stationary sources would be considered point sources. However, in practice, only sources that emit more than specified levels of certain pollutants are considered point sources. At a minimum, these levels are determined by State Implementation Plan (SIP) requirements for reporting point source emissions specified in the Clean Air Act and its Amendments under the published provisions of Title 40 of the Code of Federal Regulations Part 51 (40 CFR 51),[5] Subpart 51.321. In general, the Clean Air Act Amendments of 1977 require the development of emission inventories (especially for nonattainment areas) which are far more detailed and comprehensive than previously specified or currently available in many control agencies throughout the country.[6] State agencies are required to report point source emissions data annually to the EPA through their respective regional office for certain sources. Point sources subject to the annual emissions reporting requirements are:

> Any facility that actually emits a total of 90.7 metric tons (100 tons) per year or more of particulate matter, sulfur oxides, hydrocarbons, or nitrogen oxides.
>
> Any facility that actually emits a total of 907 metric tons (1000 tons) per year or more of carbon monoxide.
>
> Any facility that actually emits a total of 4.5 metric tons (5 tons) per year or more of lead or lead compounds measured as elemental lead.

In addition, reporting of annual emissions from individual emission points within a facility is required for those points for which:

Actual emissions of particulate matter, sulfur oxides, hydrocarbons and nitrogen oxides equal or exceed 22.7 metric tons (25 tons) per year.

Actual emissions of carbon monoxide equal or exceed 227 metric tons (250 tons) per year,

Actual emissions of lead, or lead compounds measured as elemental lead, equal or exceed 4.5 metric tons (5 tons) per year.

The provisions of 40 CFR 51 require that particulate matter, sulfur oxides, carbon monoxide, nitrogen oxides, and hydrocarbon emission data be submitted in the format of the NEDS point source coding forms.[7] Emission data for lead or lead compounds measured as elemental lead must be submitted in the format of the Hazardous and Trace Emissions System (HATREMS) point source coding forms.[7]

State agencies are required to submit emission data in the annual report for any point source for which one or more of the following conditions occurs:

A source achieves compliance at any time within the reporting period with any regulation of an applicable plan.

A new or modified source receives approval to construct during the reporting period or begins operating during the reporting period.

A source ceases operations during the reporting period.

A source's emissions have changed more than 5 percent from the most recently submitted emission data.

Concerning the last requirement, if it is determined that emissions from any point source have not changed more than 5 percent from the most recently submitted emission data, the state shall only update the year of record of the previously reported emission data.

Many state agencies have taken action to reduce the emission levels required for point source classification to levels well below those required by 40 CFR 51. The reduction in point source emission cutoff level is usually instituted by the agency to assess emissions and alternative control strategies for specific source categories/pollutants of principal interest to the agency. This focusing of point source inventorying efforts allows the agency to collect and assess detailed data on categories which meet definite criteria; e.g., they are known emitters of pollutants of concern in the jurisdiction, they consist of an identifiable and manageable number of individual sources, and they are efficiently controlled by existing technology. Gasoline marketing and dry cleaning are two source categories which generally meet the above criteria, and some agencies have elected to include all sources in these categories in the point source file even though emissions from individual sources are far less than 100 tons per year.

The accuracy and utility of the emission inventory will increase as a greater fraction of total emissions is included in the point source data file. Data in the point source file are more reliable and extensive than the data maintained in the area source file and can be readily expanded through contact with the source to include data that meet special needs of the agency; e.g., temporal emission patterns and species identification data.

1.1 PREPARING THE EMISSION INVENTORY

Five basic steps are included in the preparation of an emission inventory. The first step is planning. Prior to the initiation of data collection activities, the agency must carefully define the objectives of the inventory and develop the organization, program and schedule for preparing the inventory. All proposed procedures and data sources should be documented at the outset and subjected to review by all potential users of the final inventory, including the management and technical staff of the agency.

At the end of the planning period the agency will have defined the program for preparing the inventory. The following items,[6] which are discussed in more detail in Volume I,[1] will have been addressed and fully resolved and documented:

The end use(s) of the inventory are established.

Source categories have been defined which are compatible with available source and emission information, and are of sufficient detail to facilitate control strategy projections.

The role of existing inventory data has been determined and any previously omitted data and sources have been identified.

The geographic area has been identified. Typically, this area will consist of the agency's entire jurisdiction.

Decisions have been made on whether to temporally adjust emissions and to what level; e.g., seasonally or daily.

The point source cutoff has been defined. Sources smaller than the cutoff limit will be treated as area sources.

The point source data collection methods have been determined.

Procedures for identifying nonreactive emissions have been selected.

The agency has decided on how emissions will be projected, and the projection period, including end year and intermediate years, has been designated.

An inventory data handling system has been selected and coding forms are available.

The agency's future use of dispersion models has been considered and appropriate plans have been made to obtain all data required by the models.

Quality assurance procedures have been selected.

Written documentation of all procedures has been completed.

Manpower and budget allocations have been made and organization has been established by assigning authority and responsibilities, including those for quality assurance.

The second basic step is data gathering. A major distinction involves which sources should be considered point sources in the inventory and which should be considered area sources. Data collection procedures for these two source types are fundamentally different. Individual plant contacts, in general, are used to collect point source data, whereas collective information is generally used to estimate area source activity. Much more detailed data are collected and maintained on point sources.

Only sources that emit more than some specified cutoff level of pollutant are considered point sources. Depending on the needs of the agency, this cutoff level will vary. An emission cutoff level appreciably lower than the required level of 100 tons/year is recommended to include source categories which are identifiable, controllable and collectively significant. A recent study in several urban areas identified many VOC sources emitting less than 25 tons per year.[8] Moreover, many of these sources were in categories for which no reliable area source inventory procedures currently exist. Because of this, some agencies have opted to define cutoff levels at or below 5 tons per year in order to directly cover a large percentage of VOC and other emissions in a point source inventory, rather than rely heavily on estimates of collective emissions from area source categories.

Several methods for collecting data for point sources of emissions are presented in Chapter 2 of this volume. However, the inventorying agency must decide which procedures to use in its inventory effort. Point source data gathering methods include mail surveys, plant inspections, use of agency permit and compliance files, and source listings. The agency should determine in the planning phase which methods will be used in data collection. This determination will allow time to obtain necessary reference and support materials and help define the time and manpower requirements of the individual data collection tasks.

Special procedures may be required to obtain information not normally obtained when compiling an emission inventory. This information may be temporal data or relate to pollutant characterization; e.g., fraction of inhalable particulate or VOC compound identification. Even though the data

are not required for the basic inventory, the agency may deem it expedient to collect this information at the time plant contacts and surveys are made as part of a routine inventory update. If the agency anticipates the need for special data, it is more efficient to collect the data at the same time the other source and emission data are collected for the basic inventory.

The third basic step in the inventory compilation effort involves the analysis of data collected and the developing of emission estimates for each source. Source test data, material balances, and emission factors are all used to make these estimates. Estimates of projected emissions must also be made as part of this step. Experienced personnel with a high level of competence in process and environmental engineering and familiar with the industrial activity in the jurisdiction will be needed to assess the reliability of the collected data. Although quality assurance error checks can alleviate many of the sources of error, engineering judgment must be exercised to establish the validity of source, process, and emission information.

The fourth step is reducing and filing all collected data. The collected data and source information should be reduced to a predesigned uniform source file record format and entered into the file. The source file system can be either a computerized or a manual file system. Computerized systems can be programmed to perform some of the data analysis, error checks and calculation functions comprising the third step above. The agency, before developing its own computerized system, should consider the use of systems developed by the U.S. Environmental Protection Agency to compile, analyze and present point source emission inventory data. The National Emissions Data System (NEDS)[7] and the Emission Inventory System/Point Sources (EIS/PS)[9] are two such systems that are available to state agencies. The EIS/PS is a system which is compatible with NEDS and satisfies EPA reporting requirements. EPA will provide assistance and training to the agency and its personnel in installing and operating the system.

The fifth step is reporting. Basically, reporting involves presenting the inventory data in a format that serves the agency in the development and implementation of control programs or other regulatory efforts. Depending on the capabilities of the inventory data handling system, many kinds of reports can be developed that will be useful in numerous agency activities.

1.2 QUALITY ASSURANCE

Quality assurance procedures are needed to prepare an emission inventory of known accuracy, which can be used with some specified level of confidence to assess the impact of control strategies on emissions and air quality. Also, lower overall program costs may be realized because inventory update and revision activities will not be as extensive as when conducted without a quality assurance program and can be effectively focused on those areas of the inventory requiring the most attention.

Principles of quality assurance can be applied in planning, data collection, calculation of emissions, and reporting of the emission inventory. Quality assurance requires anticipating the measures needed in each of the inventory functions. To promote effective quality assurance, the inventory planner should consider the steps listed below prior to initiating inventory tasks.[10]

1. Planning

   - Plan to allocate resources for maximum quality assurance.
   - Plan to account for all significant emission sources.
   - Prepare a checklist of sources to be evaluated.
   - Use staff experienced in data collection and analysis.
   - Plan for routine checking of calculations.
   - Plan for checking data file entries.
   - Prepare data checking programs (when using a computer for data handling).
   - Maintain a separate quality assurance staff.

2. Data collection and analysis

   - Use redundant identification of major sources (quality assurance staff should prepare an independent source list).
   - Check questionnaire design.
   - Check data collected.
   - Check emission estimation methods.
   - Check calculated results.
   - Verify adherence to quality assurance procedures.

3. Data handling and analysis

   - Check data file entries.
   - Check individual data entries (missing emissions, SIC codes, addresses, etc.)

- Assign agency estimates for missing data.

- Check for data correctness.

- Review tabulated data for quality.

4. Data reporting

- Check pollutant emissions from individual categories and their totals against other estimates or estimates for other areas..

Volume I[1] contains an extensive discussion of Quality Assurance which will acquaint the user with the concepts and principles of quality assurance. Additional information on emission inventory quality assurance can be found in References 10 through 12 or can be obtained through an EPA Regional Office. The most effective instruments of quality assurance are the standard operating procedures developed and documented by the agency, as these steps determine methods to be used throughout the inventory effort.

1.3 DOCUMENTATION

Documentation is an integral part of an emission inventory. Review of the written documentation of an inventory's data sources and procedures by the agency's quality assurance and technical personnel will help to uncover, if they exist, errors in assumptions, calculations or methods. Remedial actions to correct detected errors will lead to the development of a reliable and technically defensible data base which is essential for enforcement actions, source impact assessments, and development of emission control strategies.

While documentation requirements may evolve during the data collection, calculation, and reporting steps of the emission inventory, these requirements should be anticipated during the planning phase. Planning the level of documentation required will (1) ensure that important supporting information is properly developed and maintained, (2) allow extraneous information to be identified and disposed of, thereby reducing the paperwork burden, (3) help determine data storage requirements, and (4) aid in identifying aspects of the inventory on which to concentrate quality assurance efforts.[6]

1.4 EMISSION INVENTORY MANPOWER REQUIREMENTS

To ensure that sufficient resources have been allocated to achieve good results with an inventory effort, cost and manpower requirements should be evaluated in the planning stage of the project. Technical manpower and budget allocations required will be a function of the number and type of sources to be inventoried and the desired data base detail. These inputs, in turn, will be affected by the inventory end use and by the data handling capabilities of the agency. Administrative and secretarial support will be a function of the technical manpower and budget allocations determined by all of these factors.[13,14]

Manpower and budget requirements will vary for each inventory effort. When an agency has conducted inventories regularly, its past experience can be used to estimate requirements. A detailed discussion of manpower requirements is provided in Volume I of this series.[1] A computer model is also available from EPA which estimates technical and administrative costs associated with emission inventories. Information can be obtained through EPA Regional Offices or from the Control Programs Operations Branch, Control Programs Development Division, MD-15, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711.

1.5 ORGANIZATION OF VOLUME

The following three chapters of this document present the "how to" for the collection, analysis and presentation of data contained in the point source emission inventory. Emphasis is given to methods that produce annual emission estimates. However, attention is devoted to preparing an annual inventory of emissions that can be adjusted to seasonal or daily temporal levels. Problems encountered in inventorying major source categories and solutions to them are provided in the final chapter. The appendices contain copies of questionnaires and associated process and emission information that have been developed by EPA for the purpose of preparing a point source inventory.

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1. Procedures for Emission Inventory Preparation, Volume I: Emission Inventory Fundamentals, EPA-450/4-81-026a, U.S. Environmental Protection Agency, Research Triangle Park, NC, September 1981.

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2.0 DATA COLLECTION

During the planning stages the agency will have made decisions which have an important bearing on the number of stationary sources to be included in the point source inventory, with the principal determinant being the emission level selected to distinguish point from area sources. The distribution of both source categories and pollutants within the point source inventory will also change as the point source emission level is lowered for all pollutants. Further changes in these distributions will occur if the agency elects to include all facilities of a source category (e.g., dry cleaning or asphalt concrete batch plants) regardless of the size of the facility, in the point source inventory.

At a minimum, the point source cutoff level will be that as defined in 40 CFR 51. However, to increase the accuracy and utility of the overall inventory, lower emission levels could be selected by the agency to increase the number of emission sources, and thus the fraction of the emission estimates maintained in the point source file. Accuracy will be increased because the inclusion of a source in the point source inventory requires some form of direct plant contact to obtain and validate the data maintained in the point source file. In addition, the far greater amount of data maintained in the point source file will allow the agency to appraise more accurately and confidently the contribution of sources to ambient air quality and the effectiveness of proposed control strategies.

The agency, in addition to reducing the point source emission level for all sources, may elect to include within the point source inventory all sources comprising a source category, regardless of the size of individual sources. Gasoline marketing and dry cleaning are two examples of source categories that are significant emitters of VOC but whose individual sources generally emit appreciably less than 25 tons per year. The agency should consider maintaining these and other source categories in the point source file, particularly those for which Control Techniques Guidelines (CTGs) have been developed (see Reference 1 for a listing of VOC source categories for which CTGs have been published) and provide for the reporting of data from these sources.

In the case of a pollutant specific inventory (e.g., lead or a hazardous organic species) the agency should identify all source categories known to emit the specific pollutant, using EPA publications and the technical literature as resources. If feasible, all sources of a specific hazardous pollutant should be included in the point source inventory file.

In addition to defining the emission cutoff limit and any specific source categories or pollutants to be included in the inventory, the agency planners should estimate the number of sources to be contacted and identify the data requirements and methods of data collection. These considerations play a major role in determining the resources necessary to achieve the objectives of the inventory.

2.1 IDENTIFICATION OF POINT SOURCES

A necessary step in preparing the emission inventory is to develop a list of the facilities to be surveyed. The list will identify each facility or plant by name, address, size, and standard industrial classification (SIC) code.* If possible, the name and telephone number of the individual at the facility who will be responsible for dealing with the agency should also be identified to facilitate further correspondence and telephone contact. The decision to include a facility on the point source mailing list will depend upon the agency's criteria for estimating potential emissions. If the process responsible for emissions is known, a determinant, such as number of employees, which correlates with emissions from the process can be used to estimate emissions. Parameters other than employment such as sales can be used to estimate emissions, however, employment is generally the most readily available parameter. Correlative relationships between employment and emissions are only rough guidelines, as is indicated by the range of values exhibited within the several VOC sources shown in Table 2-1.

The type and number of facilities comprising the mailing list will determine the design and selection of questionnaires and will give the agency an indication of how many and what kinds of sources will be included in the point source inventory. In this regard, the point source list can be used to help the agency determine if the resources allocated for the compilation effort will be sufficient. Frequently, more sources are identified than were believed to exist during the initial planning stages.

There are numerous information sources which are useful for the identification of point source candidates. Information sources which are available include the following:[1]

Existing Inventories--An existing point source inventory is the best source of information, particularly if it has been frequently updated and well documented. A list prepared from the existing inventory will require updating by (a) deleting any point source that has discontinued operation, (b) making appropriate changes for any source that has changed status, and (c) adding new point sources.

Other air pollution control agency files--Compliance, enforcement, permit application, or other air pollution control agency files may provide valuable information on the location and types of sources that exist in the jurisdiction. These files can also be utilized later to cross-check information supplied on questionnaires.

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*Because the SIC code assigned to a facility denotes the principal economic activity of the firm, the code may not correspond to the activity contributing to emissions. If possible, an appropriate source classification code (SCC), which identifies an emission producing process operation, should be assigned to the facility to ensure meaningful communication between the facility and agency.

TABLE 2-1. STANDARD INDUSTRIAL CLASSIFICATIONS (SICs) ASSOCIATED WITH VOC EMISSIONS; EMISSION-PER-EMPLOYEE RANGES

General 2-Digit SIC Categories		Specific 4-Digit SIC Categories	Emission-Per-Employee Ranges (tons/employee/yr)
20	Food	Alcoholic beverages (2085)	0.075
21	Tobacco	Not surveyed	-
22	Textiles	Coating (2295), Non-wovens (2297), Dyeing (2231)	0.536-0.89
23	Apparel	Not surveyed	-
24	Lumber & wood	Finished product (2435), (2492)	0.024-0.07
25	Furniture & fixtures	SIC: (2511), (2514), (2521), (2522), (2542)	0.08-0.24
26	Paper	Bags, box (2643), (2651), (2653), Coated papers (2641)	1.0-1.25
27	Printing	Newspaper publishing (2711), Comm. printing (2751), (2754)	0.08-0.5
28	Chemicals	Organic chemical mfg. (2821), (2823), 2861), Chemical coating (2851). Specialty chemical (2842), Carbon black (2895)	0.32-0.357
29	Petroleum	All companies	0.11-2.12
30	Rubber, Plastic	Footwear (3021), Plastics (3041), (3069)	0.16-0.256
31	Leather	Mfg. shoes (3149), Bags (3161), Personal goods (3172), Leather refinishing (3111)	0.13
32	Stone, clay, etc.	Glass products (3221)	0.03-0.092
33	Primary metal	Treating (3398), Tubing (3357)	0.10-0.267
34	Fab. metal	Screws (3451-2), Metal stampings (3469), Plating (3471), Tool mfg. (3423), (3429)	0.19-0.281
35	Machinery	Industrial machines	0.03-0.048
36	Elect. Machinery	Devices (3643), Semicond. (3674)	0.04-0.07
37	Transpt. equip.	Boats (3732), Truck bodies (3711, 13, 14, 15)	0.11-0.855
38	Instruments	Optical frames (3832) Precision instruments	0.04-0.199
39	Misc. Mfg.	Jewelry (3914-15), Toys (3944), Writing instr. (3951,53)	0.07-0.59
5171	Bulk terminals	All surveyed	-
7216	Dry cleaning	All surveyed	-

Source: Reference 1, Table 3.1-1.

Files of other government agencies--Files maintained by various Federal and State government agencies frequently aid in the preparation of the mailing list. These files may include state industrial directories wherein companies are listed alphabetically by SIC and county. Agencies to be contacted include labor, tax, commerce and trade agencies. The information available from these agencies will vary from state to state. Contact the appropriate personnel within these agencies to become familiar with the available and useful data.

EPA/CTG source listings--EPA's Division of Stationary Source Enforcement has developed point source listings for several source categories for which Control Techniques Guidance documents have been published (see Reference 1 for a discussion of these categories). The listings provide company name, address and, in some cases, a phone number for each source. These listings are available through EPA Regional offices upon request by air pollution control agencies. Because additional documents for other source categories are in preparation, the agency should also contact the EPA regional office to obtain source listings for these additional categories if available.

Local information sources--The following local information sources can be consulted, where available:

- Local industrial directories--State and local industrial, commercial and trade organizations may provide a list of sources which operate in the inventory area.

- Chamber of Commerce and Regional Planning Commissions--State and local chambers of commerce and regional planning commissions are knowledgeable about industrial activity, may publish industrial directories and should be able to provide industrial growth estimates.

- Yellow Pages--The local telephone directory will have names, addresses and phone numbers of many industrial/commercial sources. Caution is advised in that phone directory areas often do not correspond to county or community boundaries.

- Manufacturers and suppliers--Contact firms that make or supply equipment and materials used in major industrial applications. For example, a supplier of organic solvents may be able to provide information concerning the existence and location of sources or at least an estimate of the amount and types of solvents used by industry within the jurisdiction.

National publications--The following national publications can be used, when available:

- Dun and Bradstreet, Million Dollar Directory[2]--Companies with sales over $1,000,000 a year are compiled by SIC and county.

- Dun and Bradstreet, Middle Market Directory[3]--Companies with sales between $50,000 and $1,000,000 a year are compiled by SIC and county.

- Dun and Bradstreet--Industrial Directory.[4]

- National Business Lists[5]--Companies are listed by SIC and county with information on financial strength and number of employees.

- Trade and professional society publications[6,7]--Names and addresses of members are listed along with their type of business.

- Other publications[8-11] contain detailed information that may also be useful in estimating emissions.

When compiling the final point source list, special attention should be given to the Standard Industrial Classification (SIC) code associated with each source. SIC codes were devised by the U.S. Office of Management and Budget to classify establishments acording to the type of economic activity in which they are engaged.[12] Employment information should also be obtained to assist in estimating establishment and industry size and in estimating emissions. The Commerce Department reports the number of establishments and employment in states and counties by SIC.[13] Employment information by facility is generally available from state agencies and industrial directories.

2.2 DATA REQUIREMENTS

The types and quantity of data required in an emission inventory of point sources depend upon the ultimate use of the inventory and the accuracy required. The data requirements defined below are those necessary for developing a comprehensive emission inventory that can be used for mathematical dispersion modeling.[14] Included are all data requirements for point source inventories specified in Appendix D of 40 CFR 51.[15]

a. DEFINITION, GENERAL INFORMATION, AND IDENTIFICATION. The information required is as follows:

1. Geographic code identification number--using standardized state, county and AQCR identification code numbers for compatibility with other data systems.

2. Source number--this is a sequential identification number within each county; a source is a plant or facility.

3. Point number--this is a sequential number within each source (plant or facility) used to denote individual stacks, vents, or emitting points.

4. Year of record--this indicates the date of source operations data collection or update.

5. Facility name and facility address.

6. Name, address, and telephone number of person at facility to contact about plant process, emissions and air pollution control.

7. Ownership of facility--to facilitate sorting of data on the basis of private, government, or public utility ownership.

8. Confidentiality--an indicator to call attention to the possibility of the presence of confidential data.

9. Source Classification Code (SCC)--to identify the basic process or industry activity (this applies to process units which contribute to emissions from emission points within the facility).

10. Source Identification Code (SIC)--a code number assigned to a specific facility. It may or may not accurately reflect the major processes (SCC) at the plant or facility which are responsible for emissions.

b. FUEL COMBUSTION DATA. The required fuel combustion data include:

1. Combustion rate--fuel consumed per hour, this amount must be related to the source classification code to facilitate calculation of emissions using emission factors.

2. Sulfur content, in percent.

3. Ash content, in percent.

4. Heat content, in millions of Btu (or kilocalories) per SCC rate unit.

These data are applicable primarily to boilers where external combustion of oil, coal, wood, or gas as fuels takes place, or to internal combustion sources burning gas or oil. The combustion (or process) rate may vary according to season (Figure 2-1). Although the total consumption for the entire year is of most interest, it may be necessary to obtain daily or hourly consumption data on a seasonal or monthly basis to more accurately assess emissions.

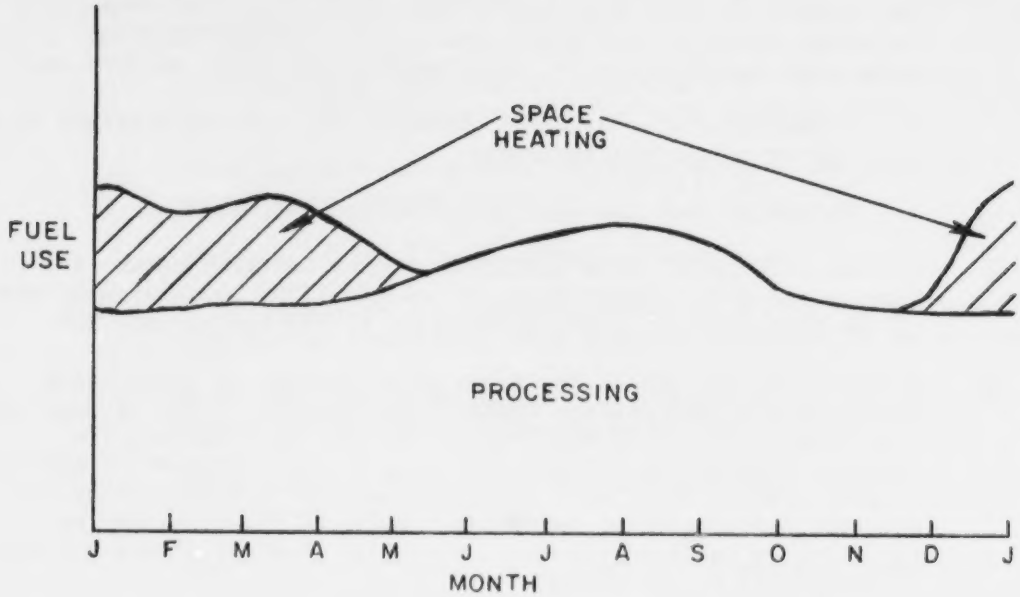

Figure 2-1. Monthly fuel use pattern.

Information on the combustion of fuels must be tied together by means of an identifier, SCC, to clearly indicate exactly which fuel is used in what combustion process. This permits the calculation of emissions by the appropriate emission factor and the application of the proper control equipment efficiency. The use of the SCC identifier also enables summary statistics reports to be prepared providing groupings by control equipment, type of combustion unit, size, etc.

The stationary point source fuels commonly in use include anthracite and bituminous coal, lignite, residual and distillate oil, natural and process gas, coke, bagasse, liquefied petroleum gas, and wood, all of which are burned in external combustion boilers. Natural gas and oil are normally used in internal combustion sources.

For fossil fuels, the sulfur and ash contents must be specified in order to determine sulfur oxide and particulate emissions. Annual actual fuel charging rate, maximum hourly design rate, and heat content of the fuel must be available for calculation of emissions.

Further classification of the sources is required in order to summarize emissions. The standard categories of electric/steam generation, industrial processing, and commercial/institutional are typically used for external combustion boilers.

c. SOLID WASTE COMBUSTION DATA. Solid waste material is usually incinerated in large municipally operated facilities, commercial buildings (hotels, apartments, etc.), and institutional and industrial facilities. The data required for those sources are:

1. Combustion rate--material quantity per hour, as required by the source classification code.

2. Estimated heat content, if estimation is possible.

d. PROCESS LOSS DATA. This particular source category covers the largest and most complex group of sources. The basic item of data is the throughput in units as required by the appropriate SCC.

e. EVAPORATIVE LOSS DATA. The major point sources of evaporative emissions are fuel storage tanks. The capacity of the storage tank, expressed in the units required by the SCC, is necessary for emission calculation. Other data (e.g., vapor pressure of material stored, type of tank, size and condition) are also necessary for accurate calculation of emissions. Fugitive emissions may be important in certain petroleum or organic chemical plants and must be considered by the agency.

f. MISCELLANEOUS EMISSION DATA. Information usually is grouped as follows:

1. Percent of annual throughput diurnally and by season--production, consumption, throughput, etc., representing the operation of the source, proportioned among the three 8-hour shifts per day and the four 3-month calendar year quarters.

2. Percent of total fuel used for space heating--this amount of fuel will be assumed to produce emissions only in the heating season.

g. EMISSION ESTIMATES. Estimates of emissions from an individual point source (in tons/year) can be made by the following methods:

1. Stack test results or other emission measurements.

2. Material balance using expertise and engineering knowledge of the process.

3. Emission factors.

4. Rough estimates.

The above methods are listed in order of preferred approach. The method of estimation must be specified in order to compare agency calculated emissions using given emission factors and control equipment efficiencies to other emission estimating methods.

h. MODELING INFORMATION. Modeling information is required for individual point sources in order to provide input for computer analysis. The items required, in addition to those previously discussed, are:

1. Coordinates of emitting point--using a standard reference system. UTM coordinates are the most commonly used.

2. Stack height--the vertical distance between the point of emission and ground level.

3. Altitude of stack base--above sea level.

4. Stack diameter--the inside diameter of a circular gas exit (equivalent cross-sectional area) at the point of emission.

5. Stack exit gas temperature--the temperature of the exhaust stream under normal operating conditions .

6. Stack exhaust flow rate--the maximum design exhaust gas volume, or measured flow rate.

7. Plume rise--predicted by an analytical expression which considers stack characteristics, meteorological conditions, and the physical and chemical nature of the effluent.

i. CONTROL EQUIPMENT. The equipment controlling each individual air pollutant at the emission point and its relative efficiency in controlling each pollutant are required. In many cases there will be a primary and a secondary item of equipment, and their relative positions in the flow may affect the overall control efficiency.

In cases where the efficiency range of the device is unknown, an estimate must be made. Equipment that normally is a part of the source will usually be considered in the emission factor. It may be anticipated that the majority of changes in the emission inventory will be in control equipment parameters. Control efficiencies must be examined closely because of the high sensitivity of emissions to estimated control efficiency, particularly at high efficiency levels.

j. COMPLIANCE DATA. The required items about each emitting point are as follows:

1. Allowable emissions--maximum emissions, in tons per year, of each pollutant that the source is legally permitted to discharge into the atmosphere under the most stringent of the following conditions:

i. Existing local/state/provincial/national regulations.

ii. Imminent legislation which will legally require the source to comply with a specific emission limitation.

2. Source compliance status.

i. In compliance

ii. Not in compliance, on compliance schedule

iii. Not in compliance, not on compliance schedule

iv. Compliance schedule
Date of schedule preparation
Equipment order date
Equipment installation date
Equipment operation date

3. Applicable control regulations.

4. Emergency control action program--certain sources are required to prepare a program for immediate reduction of emissions whenever air pollution in the area reaches prescribed conditions; this item should indicate if a program is required and, if so, whether the program has been submitted and approved.

k. LAND USE DATA. Several items used primarily in land use planning operations are normally included with source inventory data. These are:

1. Normal number of operating hours per day.

2. Normal operating days per week.

3. Normal operating weeks per year.

4. Number of employees at facility.

5. Land area of facility.

l. DATA CONFIDENTIALITY. Many sources which submit data request that all or part be kept confidential by the control agency. Legal advice may be required in such cases to assure that the data are, in fact, legally confidential. Those items actually found to be confidential must then be protected from release, and must clearly be identified in the data system, with restrictions on their use clearly documented. Quantities and kinds of emissions are not held confidential.

2.3 DATA COLLECTION

There are several methods available for the collection of point source emission data. Typical methods include mail and telephone surveys, plant inspections and use of agency permit and compliance files. The agency must determine which methods to employ to provide an accurate and comprehensive data base. Often it is necessary to use a combination of these data procurement methods to acquire the desired data base in an efficient manner.

The data collection method(s) to be employed should be determined in the planning stage of the emission inventory effort. During the planning stage, inventory personnel can review the existing inventory, permit and compliance files, and source listings to evaluate their usefulness as data sources. If, after examining the files, it is evident that the required information is incomplete and/or outdated it will be necessary to conduct a point source survey to collect the required data.

The inventorying agency has several options available. If only a few industries are involved, if a small amount of information is needed from each one, and if written verification is not necessary, a telephone survey may suffice. In addition, plant inspections by agency personnel may be applicable when there are only a few industries and/or a small geographic area involved. These survey techniques which provide direct communication with each point source can be inexpensive and quite effective in procuring required data.

In many instances, however, especially if there are numerous industries, a great deal of information needed, or a large geographical area to be inventoried, the mail survey is the most practical method for conducting an emission inventory. The primary purpose of the mail survey is to obtain source and emission data by means of a questionnaire mailed to each facility identified as a potential point source.

Activity level employment data for each facility can be used by the agency to identify those facilities within the source categories which are potential point sources and therefore should receive a questionnaire. Correlative relationships between employment and emissions should be used with caution as shown by the ranges of emissions-per-employee values given in Table 2-1 for several VOC source categories.

2.3.1 QUESTIONNAIRE

One of the most effective means of collecting information for emission inventories directly from point sources is the questionnaire. However, before proceeding with a questionnaire survey, the agency should be sure that the information desired is not already available within the agency. For example, air pollution control agencies are empowered to require permits to operate (and annual updates) which can contain source and emission data of the detail required by the inventory, including plot plans and process flow diagrams. If this information is available in the permit file, data update and/or

verification procedures, rather than the questionnaire survey, can be instituted with a considerable reduction in effort to both industry and agency personnel.

The first step in conducting a questionnaire survey is to develop a mailing list of point sources to be surveyed. Subsection 2.1 of this chapter describes methods for identifying point sources. The types of data required to conduct an atmospheric dispersion modeling program are described in detail in Subsection 2.2 (Data Requirements). To obtain the information called for in Subsection 2.2, a questionnaire is sent to each facility identified as a potential point source.

The questionnaire can be prepared as either an industry-specific questionnaire for each source category or a general questionnaire that can be completed by all source categories.[16] Generally, if the mailing list is long or if the agency is unfamiliar with many of the sources on the list, the use of a general questionnaire may be advisable. Oftentimes in practice, a general questionnaire is merely a collection of process-specific questionnaires sent out as one questionnaire. Appendix C is an example of a general emission inventory questionnaire which can be mailed to any industrial facility.[17] This form is EPA's questionnaire for point source reporting. Appendix A contains the general instructions for completing the questionnaire while Appendix B contains supplemental instructions which are industry-specific. Although the questionnaire is general in nature, these supplemental instructions provide industry-related examples for certain items on the questionnaire. Descriptions of major activities and process/operating units, feed materials and products which are typical for a specific industry category are identified to help the source owner complete the questionnaire. In addition, the units in which data should be reported are specified along with any special notes applicable to an industry grouping. The facility must provide a plot plan and process flow diagram suitably labeled to identify pertinent emission information contained in the questionnaire.

Industry-specific questionnaires are advantageous for certain sources. Appendix D is an example of a source specific questionnaire sent to operators of grain elevators. Such questionnaires will generally be shorter, because questions not applicable to the particular industry need not be included. In addition, industry-specific terminology can be used to simplify response and reduce confusion. For these reasons, inventory accuracy is increased when industry-specific questionnaires are used. However, this approach has disadvantages. One disadvantage is that the design of many industry-specific questionnaires requires significant resources and skill. Second, all the returned questionnaires cannot be processed in the same way because of the variations in format that will exist from questionnaire to questionnaire. Third, inappropriate industry-specific questionnaires may be inadvertently sent to some sources because of lack of knowledge of the emission producing operations at these sources; e.g., questionnaires provided to the facility on the basis of SIC code may not be applicable to the facility in question. This is not uncommon, particularly when the facility is owned by a large multiproduct corporation involved in integrated production of several industrial products.

The actual mailing of the questionnaires can be performed in two ways.[1] The first method is by registered mail, which documents for the agency the date of receipt of this questionnaire by the company. The rate of response will probably be somewhat greater than if the questionnaires are sent by first class mail. However, the increase in response may not justify the added expense of sending every potential source a registered letter. As a compromise, registered mail may be used only to contact major sources.

The second method is to send the questionnaires by conventional first class mail. The questionnaire is best addressed to a known responsible plant contact or, if unknown, to the attention of the plant manager. This directs the questionnaires to the proper supervisory personnel and reduces the chances of the material being lost or discarded. It is recommended that a stamped, agency addressed envelope be included with each questionnaire to facilitate return of the questionnaire to the agency.

The legal authority empowering the agency to gather the questionnaire data and requiring the facility to respond should be stipulated on either the transmittal letter or on the face of the questionnaire as shown on page C-3 of Appendix C of this volume. While the appropriate regulations and penalties must be cited, the agency should encourage cooperation by announcing its intent to provide all possible assistance to a facility. Agency personnel who are familiar with the industry and inventorying procedures should be identified in the cover letter as individuals who will, if requested by the facility, provide assistance in preparing the questionnaire.

A simple computer program can be helpful in the mailing of questionnaires and the handling of returned questionnaires. The program should be designed to produce a number of duplicate mailing labels for each source sent a questionnaire. These labels, can be attached to the questionnaire and to the stamped return envelope to facilitate the identification of the questionnaires as they are returned. Additional mailing labels may be used for other administrative purposes or to recontact those sources whose responses are inadequate. An example label is shown below:

ØØØØ (SIC Code) ØØØØ (ID Code)
INDIVIDUAL'S NAME (or PLANT MANAGER)
TITLE
COMPANY NAME
STREET
CITY, STATE, ZIP CODE

The SIC code (or the more definitive 8 digit SCC if known) can be used internally by the agency to assign the returned questionnaire to the proper agency personnel for review. The ID number is used to keep records of all correspondence with a company. If the study area is large, a county identification number may also be included on the mailing label.

It is important to develop a tracking system to determine the status of the mail survey and to update information as indicated. Such a tracking system should tell the agency: (1) which companies have been sent questionnaires; (2) the dates the questionnaires are mailed and returned; (3) if the correct name, address, and SIC or SCC information was used for each facility; (4) if recontacting is necessary based on a review of the submitted data; and (5) the status of the followup contact effort. Tracking can be accomplished manually through the use of worksheets designed for the purpose or through the use of a simple computer program.

Upon receipt of the completed questionnaires, the agency can begin analyzing the data. An initial classification of facilities based on a preliminary screening of the data should be made. Each facility should be assigned to one of the following five categories:

P - Point source
A - Area source
N - No emissions (nonsource)
OOB - Out of business
R - Recontact for clarification or additional information

Classifying the facilities in this manner will help to ensure the timely completion of the mail survey, as well as assist in estimating the amount of resources that will be subsequently needed in the inventory effort.

The questionnaire recipient should be notified, at the time the questionnaire is sent, that it may be necessary to recontact the source to clarify returned information. For this reason the questionnaire should request that the facility identify a contact who can respond to questions pertaining to the inventory effort. Sources may have to be recontacted by the agency for two basic reasons: the source may not have returned the questionnaire at all, or the response provided may be inadequate to meet the agency's needs. If the source has received the questionnaire but has not returned it as requested, it can be recontacted with a formal letter citing the appropriate statutes requiring completion of the questionnaire. When the number of sources to be recontacted is small, the information can be obtained through telephone contacts or plant visits. If the source refuses to complete the questionnaire, legal action can be taken to force a response.

2.3.2 PLANT INSPECTIONS

Plant inspections are a direct means of obtaining information or to verify data that were submitted in the questionnaire. The major advantage of the plant inspection is that it may provide more thorough and accurate information about a facility than would a questionnaire alone. In addition, errors resulting from misinterpretation of the questionnaire or the agency's misinterpretation of the response are avoided. In cases where a process is unique and/or complex, the only realistic way for the agency to gain an adequate understanding of the emitting points and variables affecting emissions is to personally observe the plant equipment and to review the

operations and process schematics with the appropriate plant personnel. Before visiting a plant, the agency should notify the plant manager or contact via formal letter of the upcoming visit and identify, to the extent possible, the specific information to be acquired at that time. This will allow the plant manager and staff to assemble the data needed by the agency prior to the visit.

The data that are gathered during a plant inspection are basically the same as those solicited in a questionnaire. Generally, more data may be obtained than would normally be requested on the questionnaire, such as plant flow diagrams, logs of various process variables and control device characteristics. Any source test data supplied by a plant should be reviewed before they are used in the inventory to make sure that acceptable sampling and analytical procedures were employed and that the test conditions were representative of the time period covered by the inventory.

Standard plant inspection forms should be developed to help the agency conduct the formal plant visit. Such forms will assist the inspector in performing a thorough inspection by specifying the information to be obtained. After the inspection, the appropriate recorded information should be checked and inserted if valid into the inventory data base. The inspection form should be placed with the facility file and maintained there for possible review by agency personnel.

2.3.3 OTHER DATA PROCUREMENT METHODS

As noted, the use of air pollution agency data such as permit and compliance file data will identify sources and the nature of their operations. The permit file is also a potential source of emission data because all sources can be required to report emissions and other necessary emission inventory data at the time of application. In addition, the facility can be required to submit plot plans and process schematics of the plant suitably labeled to identify pertinent emission information, such as stacks, processes, etc. Regular (annual) source emission updates, suitable for entering into the inventory, can be made a mandatory requirement of the permit process.

References for Chapter 2.0

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16. Development of Questionnaires for Various Emission Inventory Uses, EPA-450/3-78-122, U.S. Environmental Protection Agency, Research Triangle Park, NC, June 1979.

17. EPA Form OMB No. 158-R0075.

3.0 DATA ANALYSIS AND ESTIMATION OF EMISSIONS

Following planning and data collection, it will be necessary for the agency to analyze and assess the validity of the data received and, in most cases, to calculate emissions from the submitted source data. The validated source and emission data must be converted to a standard file format record and placed in the point source emission inventory file (computerized or manual). Sample log sheets for plant record, point record, and SCC record transactions for the EIS/PS[1] master file are shown in Figures 3-1, 3-2 and 3-3, respectively.

3.1 DATA ANALYSIS AND VALIDATION

Data analysis to assess the adequacy of the collected data is an essential element of the emission inventory, and procedures for data validation should be embodied in a formal program using standard operating procedures for data collection, data analysis and correction, and data quality assessment. A high degree of process engineering skills and familiarity with emission inventorying procedures on the part of the emission inventory staff will be required to effectively assess the adequacy of the collected data. However, to assess the status of the overall reliability of the emission inventory data file, a quality assurance organization, as discussed in Volume I of this series,[2] should be structured and given responsibility for the monitoring of the inventory data file. Working with the engineering staff, they should establish error checks and develop means for instituting corrective action as required.

3.1.1 LOCATING AND CORRECTING ERRORS AND INCONSISTENCIES IN DATA

Finding and correcting errors and inconsistencies in the source and emission data are necessary to ensure that data are complete, accurate and suitable for use by the agency in the development and assessment of control strategies. Potential sources of error found in most emission inventories are identified in Volume I, [2]Chapter 2 of this series. Some typical edit procedures to correct for data errors are cross checking of values to assure compatability; comparison of collected data with predetermined maximum and minimum source and emission data, such as those identified in Reference 3 and others as used by NEDS;* and comparison of grid coordinates with geographical boundry lines. The following types of error can be found in most emission inventories.[4]

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*Maximum and minimum values for source classification codes are available from NEDS (National Air Data Branch, U.S. Environmental Protection Agency, Research Triangle Park, NC, 27711); the agency should review these values and if possible, modify them to increase the stringency of the boundary condition limitations set by NEDS.

AGENCY _____

EMISSIONS INVENTORY SYSTEM / POINT SOURCE (EIS / PS)
COMPREHENSIVE DATA HANDLING SYSTEM (CDHS)
PLANT RECORD (SEGMENT O) TRANSACTIONS

BY _____
DATE _____
PAGE _____ OF _____

STATE	COUNTY	AQCR	PLANT ID NUMBER	DATE OF RECORD YR	DATE OF RECORD DAY
1	3	7	10	14	18

CON-TROL REGION	LOCAL CON-TROL	USER PLANT ID	CITY	UTM ZONE	OWNER	CONTACT PERSON	TELEPHONE	PRINCIPAL PRODUCT	CARD NBR	ACTION
19	22	24	36	40	42	43	58	65	78	80
									0 1	

787 ESTABLISHMENT NAME AND ADDRESS	NUMBER OF EMPLOYEES	PROPERTY AREA	CARD NBR	ACTION
19	67	71	78	80
			0 2	

ESTABLISHMENT MAILING ADDRESS		CARD NBR	ACTION
19	66	78	80
		0 3	

NEDS P7 PLANT COMMENT		CARD NBR	ACTION
19	79	78	80
		0 4	

Figure 3-1. Example point source load sheet - plant record transactions.

AGENCY _____

EMISSIONS INVENTORY SYSTEM/POINT SOURCE (EIS/PS)
COMPREHENSIVE DATA HANDLING SYSTEM (CDHS)
POINT RECORD (SEGMENT 1) TRANSACTIONS

BY _____
DATE _____
PAGE _____ OF _____

Reproduced from best available copy.

ACTION	COUNTY	AQCR	PLANT ID NBR	DATE OF RECORD YR	DATE OF RECORD DAY	NEDS POINT ID
	3	7	10	14		19

POINT ID	SIC	OP	UTM HORIZ	UTM VERT	LATITUDE DEG	LATITUDE MIN	LATITUDE SEC	LONGITUDE DEG	LONGITUDE MIN	LONGITUDE SEC	[illegible] DEG	[illegible] MIN	[illegible] SEC	[illegible] DEG	[illegible] MIN	[illegible] SEC	SULFUR CAPACITY	WASTE HEAT		CARD NBR	ACTION
	23	29	30	34	39			45			51			55			61	70		78	80
																				1 1	

STACK DIAM	STACK HGHT	TEMP	FLOW RATE	VELOCITY	FROM HEIGHT	POINTS WITH COMMON STACK	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	CONTROL REGULATORS REG 1	REG 2	REG 3		CARD NBR	ACTION
31	36	42	47	51	55	59	62	63	64	65	66	67	68	69		75		78	80
																		1 2	

PULLUTANT	CONTROL EQUIPMENT COST	[illegible]	[illegible]	CONTROL EFF	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		CARD NBR	ACTION
27	31			35	39	43	47	48	49	50		78	80
												1 3	
												1 3	
												1 3	
												1 3	
												1 3	
												1 3	
												1 3	
												1 3	
												1 3	
												1 3	
												1 3	
												1 3	
												1 3	
												1 3	
												1 3	
												1 3	

INTERPRETIVE COMMENT		CARD NBR	ACTION
		78	80
		1 4	

Figure 3-2. Example point source load sheet - point record transactions.

AGENCY _____

EMISSIONS INVENTORY SYSTEM/POINT SOURCE (EIS/PS)
COMPREHENSIVE DATA HANDLING SYSTEM (CDHS)
SCC RECORD (SEGMENT 2) TRANSACTIONS

BY _____
DATE _____
PAGE _____ OF _____

STATE	COUNTY	AQCR	PLANT ID NBR	DATE OF RECORD YR	DATE OF RECORD DAY	NEDS POINT ID	SCC I	SCC II	SCC III	SCC IV	SCC SEQ NBR
1	3	7	10	14		19	21				29

BEC NO.	BEC ID	FUNIT	FUEL PROCESS SOLID WASTE OPERATING RATE	MAXIMUM DESIGN RATE	SULFUR CONTENT	ASH CONTENT	HEAT CONTENT	A/S ORG	A/S SRC		CARD NBR	ACTION
31		36	37	44	51	54	57	62	63		78	80
											2 1	

CONF	SRC CD	SOURCE DESCRIPTION		CARD NBR	ACTION
31	32	33 — 57		78	80
				2 2	

EMF ORG	EMF SRC	POLLUTANT ID	EMISSION FACTOR	A/S CD	FUNIT	POLLUTANT ID	EMISSION FACTOR	A/S CD	A/S SRC		CARD NBR	ACTION
31	32	33	38	47	48	49	54	63	64		78	80
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	
											2 3	

NEDS P7 SCC COMMENT LEFT HALF		CARD NBR	ACTION
31 — 56		78	80
		2 4	

NEDS P7 SCC COMMENT RIGHT HALF		CARD NBR	ACTION
31 — 56		78	80
		2 5	

Figure 3-3. Example point source load sheet - SCC record transactions.

Missing facilities or sources--Permit and inventory systems out of phase; errors in estimating potential emissions; lost paperwork; problems with computer file updates.

Duplicate facilities or sources--Name changes through corporate acquisitions; use of multiple data sources with different source numbering schemes.

Missing operating or technical data--Ambiguous data request forms; intentional deletion by facility staff; inadequate followup procedures; no preliminary indication of inventory size; or overall inadequate project control.

Erroneous technical data--Misinterpretation of data request instructions; assumed units, faulty conversions, etc.; intentional misrepresentation by the facility; poor handwriting and transcription.

Improper facility location data--Recording coordinates of facility headquarters instead of the operating facility; inability of technicians to read maps; failure to observe inventory area boundaries.

Inconsistent area source categories or point source sizes--Failure to designate inventory cutoffs.

Inaccurate or outdated data--Mixed use of primary and secondary data without a policy for standardizing data.

Errors in calculations--Transposition of digits; decimal errors; entering wrong numbers on a calculator; misinterpreting emission factor applications.

Errors in emission estimates--Imprecise emission factors; applying the wrong emission factor; errors in throughput estimates; improper interpretation of combined sources; errors in unit conversions; faulty assumptions about control device efficiency; failure to exclude nonreactive emissions.

Reported emissions wrong by orders of magnitude--Recording the wrong identification code for subsequent computer emission calculations; ignoring implied decimals on computer coding sheets; transposition errors; data coding field adjustment errors.

To correct the above errors the agency should use a staff experienced in data collection and analysis to check data file entries or to institute computerized edit programs. The Quality Assurance staff together with the Engineering Staff should develop procedures (manual or computerized) to detect and correct errors or identify data requiring plant verification.

3.1.2 ENGINEERING ASSESSMENT OF DATA

Engineering analyses include quick reviews by technical personnel to detect any numbers which are obviously much too high or low--possibly indicating a decimal placement error--and to identify unreasonable responses such as "no emissions," "100 percent control efficiency," etc. Engineering assessments will also include more detailed review of data to reveal errors not readily discernible by quick-scans. A summary of some specific engineering assessment techniques available to the agency follows:

Emission estimate calculations using emission factors or material balances will provide a check on the reliability of questionnaire responses. Although emission factors are only average values, emission rates reported by the source should be in the same range as the emisson estimate based on emission factors. If a significant difference appears, this will signal a need for data verification.

Process parameters should fall within acceptable limits, for example, excess air for a combustion process should not be less than 5 percent, 10 percent and 25 percent for gas, oil and coal, respectively. Based on these values, if the actual volume flow is calculated to be 190, 195 and 220 scfm/million Btu or less for gas, oil and coal, respectively, then information provided for the volume flow and/or heat input are incorrect. The upper limit of excess air for combustion processes is about 100 percent, equivalent to about 350 scfm/million Btu of heat input. Excess air or stack flow values exceeding these limits should be considered questionable.

Stack temperature should also fall within certain limits. Maximum temperatures which can be expected for coal, oil and natural gas-fired boilers are presented in Table 3-1. A stack temperature below 100°F indicates that a combustion process is probably not involved. If the stack temperature is below 250°F and a scrubber is not being used, then the temperature specified may be too low. If the stack temperature is above 250°F and a scrubber is being used, then the temperature may be too high.[3]

Fuel usage data can be checked by dividing the annual fuel consumption by the number of hours of operation per year. If this ratio exceeds the design maximum firing rate, an error is indicated. If the ratio is less than 0.15 times the maximum continuous rate, then equipment utilization is either very low or else incorrect data have been specified. In either case, a low value should be checked for possible errors.

Different gas cleaning devices have characteristic ranges of efficiency when used in conjunction with various combustion sources and industrial processes. An efficiency range can be developed using emission factors in AP-42,[5] RAPS[6] and emission factors from state agencies. Emission data obtained in the survey can be checked against this range to identify possible inaccuracies.

TABLE 3-1. EXAMPLES OF PARAMETER CHECK VALUES

Parameter for which check is needed	Source	Check value
Actual volume flows	Boiler-coal	$\leq$220 scfm/10^6 Btu/hr
	Boiler-oil	$\leq$195 scfm/10^6 Btu/hr
	Boiler-gas	$\leq$190 scfm/10^6 Btu/hr
Stack temperature	Boiler-coal <250 mmBtu/hr	$\geq$320°
	Boiler-oil <250 mmBtu/hr	$\geq$500°
	Boiler-oil >250 mmBtu/hr	$\geq$350°
	Boiler-gas <250 mmBtu/hr	$\geq$600°
Actual velocity		<1,000 fpm
Actual velocity		>6,000 fpm
Stack height	(all stacks)	$\geq$1,000 ft
Stack height	(boilers)	$\leq$40 ft
Operating time		
hours/day		>24
days/week		>7
weeks/year		>52
Control efficiency		>0 for no controls

Check values are also available for validating information for both production and emission rates. For most operations, emission rates are proportional to the production rate; i.e., an increase in the production rate will normally result in a proportional increase of emissions. As a result, the ratio of normal to maximum production rate should approximate the ratio of normal to maximum emission rates. Where these proportions differ, an investigation should be made to determine if there is an error in the emission calculation.

A computer program can be used to check data against a set of limits and identify potentially erroneous data. Once identified, recalculations and followup contacts can be used to verify or correct potentially erroneous data. As noted, maximum and minimum parameter values are available from NEDS for the purpose of flagging questionable data.

While engineering techniques and calculation are available to assess and validate much of the data, some inaccuracies inherent to the inventory system are impossible to identify without periodic updates including scheduled plant inspections. Deterioration of control equipment, inadequate hooding systems resulting in excessive fugitive emissions, abnormal operations and process upsets, and variations in raw materials represent some of many potential sources of inaccuracy in the inventory which must be checked by discussions with facility personnel and by plant visits.

3.2 ESTIMATION OF EMISSIONS

There are three basic methods for determining emissions from point sources: source test data, material balances and emission factors. The three methods are discussed below.

3.2.1 SOURCE TEST DATA

If source test data are available at the agency or from the source, this method of estimating emissions is usually the most accurate method. Source test data should be used if the data were obtained under conditions which are representative of or relatable to operating conditions normally encountered at the source using test conditions of known accuracy and precision. If facility operation and test methods employed during the source test cannot be adequately characterized, the source test data should not be used.

3.2.2 MATERIAL BALANCES

Material balances are commonly used for estimating emissions from many source categories, primarily VOC sources. In its simplest form, the material balance assumes that all VOC entering the process is emitted. However, as noted in Reference 4, situations often exist where the above assumption does not apply. VOC may be retained in the product, destroyed in the process, or physically removed for reprocessing or disposal. In other cases; e.g., bulk

storage of petroleum products, the amount of solvent lost by evaporation is small compared to the capacity or throughput of the source and cannot be accurately determined by a material balance.

3.2.3 EMISSION FACTORS

Stack test results or other emission measurements are not always available for each point source in the inventory. Similarly, source-specific process information, necessary to perform a material balance, may be deficient. In such cases, the agency must rely on emission factors to estimate emissions. The emissions from a process are estimated by multiplying the emission factor by the activity of the process (SCC unit). The SCC unit is a process parameter, usually production rate, which can be correlated with emissions. Emission factors are most valid when applied to a large number of individual sources especially over extended periods of time. Emission factors are developed from source tests, material balance studies, and engineering estimates.

Emission factors are most accurate when the relationship between process data and emissions is direct and relatively uncomplicated.[6] If, for example, the sulfur content of eastern bituminous coal used as fuel in a large industrial boiler is known, the use of the emission factor (38 S lbs of sulfur oxide per ton of coal, where S is the sulfur content of the coal in percent)[5] to estimate sulfur dioxide is accurate for most uses of the inventory. The sulfur in bituminous coal is converted virtually completely (95 percent) to SO_2 and conversion of SO_2 to particulate sulfate and SO_3 (normally 1 to 3 percent) prior to emission is not considered significant from the standpoint of the accuracy of the inventory of sulfur dioxide emissions. An entirely different situation exists, however, in the case of estimating the emissions of the oxides of nitrogen from an industrial boiler. The emission factor for nitrogen oxides, as given in AP-42,[5] varies with both the type and size of the combustion unit, from 6 to 55 lb of NO_x per ton of coal. This is because the factors affecting NO_x production include flame and furnace temperature, residence time of the combustion gases in the conbusion zone, rate of cooling, amount of excess air, as well as the amount of nitrogenous compounds in the fuel. Thus, the emission factor of 18, which is applicable to a pulverized coal boiler burning 100 tons per hour, is an average value. Actual emission values for specific boilers may differ significantly from the quantities estimated using the average factor.

The agency conducting the inventory should be aware of the accuracy of the emission factors being employed so that gross emission estimate errors can be avoided. If an emission factor for a specific source or a source category will not provide a reasonably accurate emission estimate, it is always better to rely on actual stack test data. Conversely, if an emission factor will provide accurate emission estimates, stack testing may represent an ineffective use of valuable time and resources.

3.2.3.1 Available Emission Factors

EPA report No. AP-42,[5] "Compilation of Air Pollutant Emission Factors," is a compilation of emission data for use by individuals and groups responsible for conducting air pollution emission inventories. Emission factors provided in this document cover most of the common emission source categories: fuel combustion by stationary sources; combustion of solid wastes; evaporation of fuels, solvents, and other volatile substances; various industrial processes; and miscellaneous sources. When source-test data are unavailable, these factors can be used to estimate the quantities of air pollutants (particulates, CO, SO_2, NO_x, and hydrocarbons) being emitted from a source or source category. Qualitative estimates of the quality of the emission factors are provided for each tabular listing of emission factors.

When an emission factor is not available in AP-42 for a specific source, it is often possible to acquire emission data from various technical publications. Numerous EPA reports are available which present the results of engineering investigations concerning air emissions from a number of different processes. EPA New Source Performance Standards documents and Control Techniques Guidelines documents, and other EPA reports discussed in more detail in Chapter 5 are potential sources of information from which emission factors can be developed. Fugitive emission factors for a number of industrial operations are presented in Reference 7. That report and similar engineering reports are assigned to the Environmental Protection Technology Series which are available through the National Technical Information Service, Springfield, Virginia 22161. It is important to note that AP-42 is regularly updated to reflect the information available in the EPA reports mentioned above. The most recent update of AP-42 should be used by the agency to ensure that the best available emission factors are employed.

3.2.3.2 Development of Emission Factors

Emission factors have been developed and compiled in EPA report AP-42[5] for most major sources of air pollution. However, it is not unusual for a given geographical area to contain point sources for which no emission factors exist. In such instances it will be necessary to develop an emission factor through source testing, material balance or engineering estimates.

Source testing is the preferred method of developing an emission factor because it generally provides the most accurate results. Agency personnel who are familiar with the source operation should be present during the testing to monitor the process. The emission factor developed from the source test data will provide accurate emission estimates only if the process was operating at normal (average) operating conditions during the test. However, upset conditions of appreciable magnitude or frequency are occurrences that can invalidate estimates of emissions from many sources regardless of the accuracy of the emission factor developed during periods of normal operation. The agency should attempt to identify facilities/processes/equipment prone to significant deviation from normal emission patterns. Mandatory reporting of such occurrences by the plant or their detection through agency surveillance

are means of identifying emission upsets. Excess emissions resulting from process or control device inadequacies or malfunctions can have a significant effect on emissions and must be considered by the agency in estimating emissions from the sources.

Often it is not possible to conduct source testing to develop an emission factor. If this is the case, agency personnel may have to develop emission factors based on material balances or general engineering judgments. A knowledge of the exact quantities of materials entering and exiting a process will aid the agency in developing an emission factor, provided material balance information is available at all emission points.

Developing emission factors without source test and material balance data will require application of sound engineering judgment usually based on analogy with similar processes. Plant visits to observe the process and evaluate emissions may be helpful in developing emission factors; e.g., the opacity of stack emissions may provide a rough estimate of mass particulate emissions.

3.2.4 CALCULATION OF EMISSIONS USING EMISSION FACTORS

In order to calculate emissions from emission factors, various inputs to the estimation algorithm are required. These inputs are:[5]

1. Activity information from the source inventory,

2. Emission factors to translate activity information into "uncontrolled" emission estimates, and

3. Control device efficiency information to provide the basis for estimation of emissions to the atmosphere after passage through the control device(s).

The basic emission estimation algorithm is:

$$E = R \times EF \times \left(1 - \frac{C}{100}\right)$$

where E = emission estimate for source (at the process level),

R = activity level (such as throughput),

EF = emission factor (such as lb emitted/throughput), and

C = control device efficiency (in percent).

The accuracy of the emission estimate is equally dependent upon the relative accuracy of each of these individual components. Errors introduced into any one of these components will affect the final emission estimate.

3.2.4.1 Activity Data

Activity data are generally reported as fuel consumption rate (in tons, 10^3 gal, 10^3 or 10^6 cu ft per hour) or process weight (in lb, ton, gal or bbl per hour) for fuel burning equipment and industrial processes, respectively. The optimum activity data are hourly values, although in some cases only shift, daily, weekly or even monthly data are available. If hourly values are not known, the hourly average value can be calculated from the operating pattern; e.g., 5 days per week, 8 hours per day, closed for holidays and a 2-week vacation period.

In many instances, conversion factors must be applied to convert reported consumption or production values to units that correspond to the SCC emission unit; e.g., gallons to pounds, barrels to gallons, cubic meters to cubic feet, etc. Most conversions will be straightforward; others may require recontacting the facility to insure that the correct conversion factors are applied; for example, to convert production rate from the number of panels of plywood to the SCC units of tons processed. Problems associated with the conversion of activity data to SCC units can be minimized by clearly specifying the required units on the questionnaire submitted to the facility. In any case, conversions should be made prior to data entry into the file.

Combustion activity is often reported as power output (megawatt hours/hr) or steam production (lb/hr). These activity data must be converted to the equivalent fuel consumption (Btu/hr) using the following conversion factors:

$$1 \text{ MW} = 3.413 \times 10^6 \text{ Btu/hr}$$

$$1 \text{ lb steam/hr (300 psi, saturated)} = 1202 \text{ Btu/hr.}$$

Fuel consumption over the desired time interval is then converted to the desired SCC activity units (tons burned for coal), using the heating value of the fuel. A correction factor representing the fractional efficiency of the fuel burning equipment is applied for conversion of heat input to power output (electrical) or steam production (thermal).

Typical sample calculations for mass emissions in lb/hr are shown below for fuel activity data and process activity data.

Example 1: Calculation of Particulate Emissions Using Fuel Activity Data for SCC 1-01-002-02 (coal-fired utility boiler).

Given the following pertinent data:

Firing Rate (R)	30 ton/hr
Average Ash Content (A)	7.5 percent
Emission Factor (EF)	13A lb/ton
Collector Efficiency (C)	95 percent

Emissions are calculated using:

$$E_{part.} = R \times EF \times (1 - \frac{C}{100})$$

where $E_{part.}$ = mass emission of particulates (lb/hr).

In this case:

$$E_{part.} = 30 \times 13(7.5) \times (1 - \frac{95}{100}) = 146.3 \text{ lb/hr.}$$

Example 2: Calculation of Particulate Emissions Using Process Activity Data for SCC 3-04-003-03 (electric induction furnace).

Given the following pertinent data:

Process Weight Rate (R) . . . . . 30 ton/hr

Emission Factor (EF). . . . . 1.5 lb/ton

Collector Efficiency (C). . . . . 95 percent

Emissions are calculated using:

$$E_{part.} = R \times EF \times (1 - \frac{C}{100})$$

where $E_{part.}$ = mass emission of particulates (lb/hr).

In this case:

$$E_{part.} = 30 \times 1.5 \times (1 - \frac{95}{100}) = 42.75 \text{ lb/hr.}$$

3.2.4.2 Control Device Efficiency

Control device efficiency is the third element of the linear emission algorithm. Control device efficiency may be determined for specific equipment by source tests to measure concentrations before and after the control device. However, because of possible variation in control device operation with process, control device malfunction and deterioration over time, etc., the measurement is subject to the potential limitations of all source tests.

When test data are not available for a specific control device, literature values may be used for estimating control efficiency. EPA publication AP-42[5] supplies control device efficiencies for control devices which are commonly encountered in industrial applications. These control efficiency estimates, in reality, may not be precisely applicable to specific

control devices. In addition, a control device may be improperly sized for effective control of the process under consideration. Therefore, the estimate should be tempered with knowledge of the process and engineering judgment.

A third method of obtaining a control device collection efficiency is to employ the manufacturer's design specification or guaranteed performance specification subject to field verification. However, the design collection efficiency reported by manufacturers is the efficiency obtainable under optimum conditions which may not represent actual conditions. Some assessment of design efficiency may be required to adjust for these source conditions.

It may also be necessary to modify the control device efficiency estimate based on considerations such as "downtime." If the devices are shut down periodically for maintenance, upset, etc., then the emissions released in 1 hour may far exceed those released in the "controlled" mode over many hours of operation. Failure to account for excess emissions resulting from "downtime" could be a large source of error in the inventory. It should be noted, however, that, in general, regulations and permitting conditions preclude the operation of the emitting processes by the source when the control equipment is inoperative.

3.3 TEMPORAL ADJUSTMENT OF THE ANNUAL INVENTORY

Most emission inventories have traditionally estimated annual emissions. However, emissions from many source categories are subject to large seasonal and/or hourly variations. Some source categories exhibit pronounced temporal dependence due to changes in activity levels or to physical changes resulting from climatic conditions. For example, a public school or university will consume most of its fuel during the winter heating season. Diurnal patterns of activity will also be apparent. Consequently, it will be necessary to obtain hourly consumption data on a seasonal or monthly basis to determine these fuel use patterns. The questionnaire should request sufficient activity level information so that the desired variations can be determined.

Accounting for temporal physical changes, such as changes in the vapor pressure of VOC with temperatures, is not as easily addressed as temporal activity level changes and will require a greater level of effort. Reference 4 should be consulted for a detailed discussion of methods for temporal adjustment of the annual inventory for VOC sources.

3.4 EMISSION PROJECTIONS

Emission inventory projections are needed by an agency to determine if a given area will achieve or exceed ambient standards in future years. There are two basic types of projections, baseline and control strategy, defined as follows:

Baseline Projections--Estimates of future year emissions that take into account (1) expected growth in an area and (2) air pollution control regulations currently in effect at the time the projection is made.

Baseline projections also take into account the effect of adopted regulations which will become effective at some date prior to the projection year.

Control Strategy Projections--Estimates of future year emissions that take into account the effect of modified or additional control regulations on baseline projections.

Baseline projection inventories of annual emissions for the particular years of interest will probably not be available from past inventory efforts, and projection inventories that do exist may not reflect all of the growth and control scenarios that the agency may wish to evaluate. Hence, the agency will have to devote resources to the development of projection year inventories. The following general considerations should be kept in mind from the outset of inventory planning:[4]

1. To a large extent, projection inventories will be based on forecasts of industrial growth, population, land use, and transportation. The air pollution agency is generally not equipped and should not attempt to make these forecasts but, rather, should rely on the local Metropolitan Planning Organization (MPO), Regional Planning Commission (RPC), or other planning agencies to supply them. This course has two major advantages. First, it would be extremely costly for the air pollution agency to duplicate the forecasts made by other planning agencies. Second, the air pollution agency needs to base its emission projections on the same forecasts as other governmental planning agencies. This consistency is necessary to foster the credibility of any proposed control programs based on emission projections.

2. The control strategies under consideration may influence the type of data collected as well as the structure of the inventory itself. As an example, if the agency wants to test the effect of applying Stage I controls on tank trucks unloading only to service stations above a particular size, it may be desirable to treat these particular stations as point sources rather than including them in a general service station area source category.

3. It is important that all emissions projected for future years be determined using the same methods and procedures that were used to determine base year emissions. Use of the same techniques assures consistency between base year and projection year emission estimates and avoids possible errors resulting from changes in methods and procedures.

4. Projection inventories will always be open to question because of their somewhat speculative nature. Internal and external review of emission inventory projections, including extensive research and documentation of assumptions, methods, and procedures, will improve their technical quality and enhance credibility.

3.4.1 MAJOR POINT SOURCE PROJECTIONS

The most direct approach for projecting emissions from major point sources is to obtain information on each facility. This type of projection information would ideally be determined by contacting plant management, but it could be solicited on questionnaires. Generally, questionnaires would not be sent out solely to obtain projection information, but this additional information may be elicited on questionnaires used in periodic updates of the baseline inventory. Permit applications submitted to various Federal, state, and local agencies should also be screened for information on expected expansion or new construction. In addition, the local metropolitan planning organization and other planning bodies must be contacted for any information they may have on projected industrial expansion and for comment on the reasonableness of any plans submitted by industrial facilities.

Once this type of projected plant growth information is obtained, the agency needs to determine what regulations will apply in order to estimate controlled emissions. In the baseline projections, existing applicable regulations are evaluated. For instance, a fossil fuel power plant now under construction and expected to start operation in 2 years would be subject to Federal New Source Performance Standards (NSPS) for particulate, SO_2 and NO_x. Hence, unless plant personnel indicated that more stringent controls will be applied, the resulting emissions could reasonably be assumed to be equal to the standard. Similarly, the effects of any other future regulations which would impact the source would have to be evaluated.

As an example of making point source projections for specific sources,[4] consider a facility employing a large open top vapor degreasing operation that emitted 100 tons of solvent per year in 1977, based on an annual production of 10,000 units of a particular metal part. Assume that no control measures are planned to reduce solvent losses from the process. The plant projects that 5 percent more metal parts will be produced per year until 1982 using the existing operation, and that, in 1987, a replacement facility will be brought on line at another location within the plant to produce 20,000 parts per year. The source is located in an ozone attainment area where RACT is not required on VOC sources. To estimate VOC emissions from this source for a 1982 projection inventory, one could assume that, since no additional controls are expected, the current emission level can be multiplied by the cumulative growth rate in metal parts production (i.e., 5 years at 5 percent/year = $[1.05]^5 = 1.28$, or 128 percent) to estimate 1982 VOC emissions. (Emissions are assumed proportional to production.) Thus, emissions for 1982 can be estimated at 128 percent of 100, or 128 tons per year, and the point source record for this projection year should be adjusted to take this growth into account.

Continuing this example, suppose a control strategy projection is desired for 1987 to evaluate the effect of RACT as an alternate control strategy. In this case, both growth and controls must be considered. As a first approximation, if a similar open top vapor degreasing operation is used in the new facility, one can assume that, since 1987 production will be twice 1977

production, uncontrolled emissions from the replacement plant will be twice those of 1977, or 200 tons per year. Since the new plant will be subject to RACT in this control scenario, VOC emissions will be reduced 45 to 60 percent from the uncontrolled case.[8] Hence, projected emissions in 1987 would be only 80 to 110 tons per year, depending on which RACT measures were instituted. Note that, since the replacement facility commences operation in 1987, it should be included in the 1987 projection inventory as a new point source, and the old source deleted from the inventory.

3.4.2 AGGREGATE POINT SOURCE PROJECTIONS

In many instances, projection information will not be available from the management of individual facilities. In addition, some source categories, such as small industrial boilers, will be too small and too numerous to justify the solicitation of projection information. In these situations, emission growth trends of sources for which projection information have been obtained can be applied to similar sources which were unable to provide projection information.

Surrogate indicators of growth rate can also be used; e.g., employment projections for industrial manufacturing categories.[9] Regardless of what surrogate indicators are used for making projections, the basic calculation is the same for a source category. The ratio of the value of the surrogate indicator in the projection year to its value in the base year is multiplied by the base year activity level to determine the projection year activity level. Because the projection years of interest to the air pollution control agency may not be the years for which growth projections have been made by other planning agencies, interpolation of projection year data may be required. The planning agency responsible for the projection should be contacted to determine whether straight line or other interpolation methods should be employed.

3.4.3 PROJECTION DOCUMENTATION AND REVIEW

Because the projection inventories are so important in control strategy development, they should be carefully reviewed for errors by experienced personnel. The projection review is most readily accomplished if all assumptions, procedures and data sources used are carefully documented. This documentation and review process will help assure that all the projections are (1) consistent with other projections being made in the area; (2) objective and not biased toward any particular policy; (3) open, with all assumptions and estimates clearly stated for review; and (4) defensible because of thorough documentation and review.

The key aspects of projections that will invite criticism are: (1) the viability of indicators used for projecting activity level growth; (2) how, when and where this growth will occur; and (3) what emissions will be associated with this growth. When planning, compiling and reviewing the point source projection inventory, the agency should focus particular attention on these issues.

References for Chapter 3.0

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4. Procedures for the Preparation of Emission Inventories for Volatile Organic Compounds, Volume I, Second Edition, EPA-450/2-88-028, U.S. Environmental Protection Agency, Research Triangle Park, NC, September 1980.

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4.0 PRESENTATION AND DOCUMENTATION OF THE INVENTORY

4.1 PRESENTATION OF THE INVENTORY

The final phase of an emission inventory activity is to present the data which have been collected, compiled and analyzed. The data can be presented in a variety of forms, from unorganized raw data listings to aggregated summary reports. Generally, the form in which the data will be presented is determined by (1) how the data can be most efficiently summarized, and, more importantly, (2) the purpose of the inventory.[1]

The purpose of the emission inventory is the primary consideration when adopting a reporting format. An inventory developed only for research purposes can be presented in many forms ranging from a raw data listing, which basically presents all data compiled in the inventory in the form of computer printouts of sources and emissions, to summary reports.

A summary report includes information that has been aggregated and organized in some manner during the reporting process. For instance, a summary report of total VOC emissions from all dry cleaners in an area would involve a totaling of emission data stored in certain file records. In many instances, some analysis of the data; e.g., evaluation of alternative controls, might also be performed in the process of preparing a summary report.[2]

Many inventory reports, such as those required for State Implementation Plan (SIP) submissions, and certain other control strategy inventory reports, must meet formatting requirements set forth in local, state and EPA regulations. The reporting format required in the 1982 State Implementation Plan submittals for VOCs is shown in Figure 4-1. Because the agency must be able to determine and compare the impact of employing various control strategies, such as RACT, a common format is considered desirable to promote reporting consistency. The format presented in Figure 4.1 required for reporting VOC emissions in 1982 SIPs,[3] is an example of one level of reporting. This format allows the agency to identify all major source categories of volatile organic compound emissions and to determine the reductions that may occur in an area if various control strategies are employed.

In addition to required reporting formats, a variety of tables and graphic displays can be employed to present inventory data. Charts, tables and graphs can be formatted to depict emission breakdowns by industries, geographical areas, or source size. Emission trends and the effects of control programs can also be tabulated or graphed. Several examples of tables and graphs are presented in Volume I of this series. Tabular reports are the most common kind of report, as they can be readily generated from computerized inventory systems such as the EIS/PS.[4] Certain types of graphic displays

	Base Year		Projection Year	
	Point	Area	Point	Area
STORAGE, TRANSPORTATION AND MARKETING OF VOC				
Oil and Gas Production & Processing				
Gasoline and Crude Oil Storage[1]				
Synthetic Organic Chemical Storage & Transfer				
Ship and Barge Transfer of VOC				
Barge and Tanker Cleaning				
Bulk Gasoline Terminals[2]				
Gasoline Bulk Plants[3]				
Service Station Loading (Stage I)				
Service Station Unloading (Stage II)				
Others				
INDUSTRIAL PROCESSES				
Petroleum Refineries				
Lube Oil Manufacture				
Organic chemical Manufacture				
Inorganic Chemical Manufacture				
Fermentation Processes				
Vegetable Oil Processing				
Pharmaceutical Manufacture				
Plastic Products Manufacture				
Rubber Tire Manufacture				
SBR Rubber Manufacture				
Textile Polymers & Resin Manufacture				
Synthetic Fiber Manufacture				
Iron and Steel manufacture				
Others				
INDUSTRIAL SURFACE COATING				
Large Appliances				
Magnet Wire				
Automobile				
Cans				
Metal Coils				
Paper				
Fabric				
Metal Wood Products				
Miscellaneous Metal Products				
Plastic Parts Painting				
Large Ships				
Large Aircraft				
Others				

	Base Year		Projection Year	
	Point	Area	Point	Area
NON-INDUSTRIAL SURFACE COATING				
Architectural Coatings				
Auto Refinishing				
Others				
OTHER SOLVENT USE				
Degreasing				
Dry Cleaning				
Graphic Arts				
Adhesives				
Cutback Asphalt				
Solvent Extraction Processes				
Consumer/Commercial Solvent Use				
Other				
OTHER MISCELLANEOUS SOURCES				
Fuel Combustion				
Solid Waste Disposal				
Forest, Agricultural, and Other Open Burning				
Pesticide Application				
Waste Solvent Recovery Processes				
Stationary Internal Combustion Engines				
MOBILE SOURCES				
Highway Vehicles				
a. Light Duty Automobile				
b. Light Duty Trucks				
c. Heavy Duty Gasoline Trucks				
d. Heavy Duty Diesel Trucks				
e. Motorcycles				
Off Highway Vehicles				
Rail				
Vessels				

[1] Includes all storage facilities except those at service stations and bulk plants.
[2] Loading tank trucks and rail cars.
[3] Storage and transfer operations.

Figure 4-1. Tabular reporting format for 1982 State Implementation Plans.

are difficult to produce using a computer and require time and manpower to develop manually. Most of the NEDS and EIS raw data and summary reports available to the public are of the tabular variety. The various NEDS reporting programs are described in detail in Reference 5. The EIS reports are compatible with NEDS and satisfy EPA reporting requirements.

4.2 DOCUMENTATION OF THE INVENTORY

Documentation of the emission inventory is necessary for all inventory uses. Documentation entails keeping a record of all methods, assumptions, example calculations, references and results employed in the compilation effort. The goals of documentation are to provide in written form an explanation to both the agency and outside users as to (1) how the inventory was compiled and (2) its reliability. Proper documentation of the inventory will help an agency when future inventories are conducted. Therefore, compiling and maintaining documentation in support of data is recommended in all emission inventories.

The following kinds of documentation of point source procedures will achieve inventory goals.[2]

A. Background information should be presented on reasons for compiling the inventory, its future uses, how it evolved, and the significance of changes from emissions of previous years.

B. The geographic area covered by the inventory should be specified. This may be a county, air basin, AQCR, etc. A map of the area should be included.

C. Population, employment and economic data used in projections should be presented. This includes data used in calculating emissions with per capita emissions and emissions-per-employee factors (see Item G).

D. The time interval represented by the emission inventory should be specified (e.g., annual, seasonal, hourly, etc.).

E. Record any proposed or promulgated control strategy programs that will affect the baseline inventory. In control strategy inventories, include graphs and tables to illustrate progress toward air quality goals.

F. Baseline emission estimates should be summarized by source category in tabular format.

   1. Source categories for which the emissions are negligible should be listed as "Neg".

   2. Source categories for which there are no emissions in the study area should be listed as "0".

G. A narrative should also be presented for each category of the inventory. Much of the information contained in the narrative should also be in the agency's procedure manuals which it should prepare and follow. The narrative should contain at least the following:

1. Procedures used to collect/analyze the data--All procedures for data collection and analysis should be fully described. A concise point source/area source definition should also be included.

2. Sources of the data--A complete description of the types of sources assessed in the course of compiling the inventory should be presented. These sources would include, for example, permit files, inspection reports, source test data, actual company inquiries, other agencies, etc. A statement should be included assessing the completeness of the data collected.

3. Copies of questionnaires--Samples of questionnaires mailed to various source categories for the collection of data should be included as part of the inventory documentation.

4. Questionnaire statistics--Statistics regarding the questionnaires should be presented. This information should include:

   a. The number of questionnaires sent

   b. The number for which response was received

5. Emission factor citation--Emission factors used for the calculation of emissions should be clearly identified. Factors from sources other than AP-42 may be used but a rationale for the use of these other factors should be provided. Source test data are preferred over emission factors.

6. Method of calculation--Sample calculations for each type of computation should be presented, to allow for an independent verification of the computations. (Some emission factors are frequently misused.) Techniques for excluding nonreactive VOC from a VOC inventory should be described.

7. Assumptions--Any assumptions made in any part of the procedures should be clearly stated.

8. Items not included--Any sources of emissions which are not included in the inventory should be itemized in the narrative. A statement as to why these sources were excluded should be presented. A possible reason for exclusion could be, for example, that the emissions from these sources are known to be negligible.

9. Quality assurance procedures--All procedures and the results of their application to inventory activities plus an estimate of the reliability of the data base for major categories and the overall inventory should be presented.

10. References--A list of references should be included as a final section of the narrative.

A technically sound inventory, if well documented, can be useful for several years with only annual updating. Proper documentation will allow the agency to update the inventory in a prompt and efficient manner and to readily institute procedural changes reflecting advances in methods and procedures for inventory preparation.

References for Chapter 4.0

1. Procedures for Emission Inventory Preparation - Volume I: Emission Inventory Fundamentals, EPA-450/4-81-026a, U.S. Environmental Protection Agency, Research Triangle Park, NC, September 1981.

2. Procedures for the Preparation of Emission Inventories for Volatile Organic Compounds, Volume I, Second Edition, EPA-450/2-77-028, U.S. Environmental Protection Agency, Research Triangle Park, NC, September 1980.

3. Emission Inventory Requirements for 1982 Ozone State Implementation Plans, EPA-450/4-80-016, U.S. Environmental Protection Agency, Research Triangle Park, NC, September 1980.

4. The Emission Inventory System/Point Source User's Guide, EPA-450/4-80-010, U.S. Environmental Protection Agency, Research Triangle Park, NC, May 1980.

5. AEROS Manual Series, Volume III: Summary and Retrieval, Second Edition, EPA-450/2-76-009a, U.S. Environmental Protection Agency, Research Triangle Park, NC, July 1977.

5.0 INVENTORYING MAJOR POINT SOURCE CATEGORIES

The preparation of an emission inventory of point sources involves direct contact with the source to collect the necessary process and emission information. Although data collection procedures are straightforward, the assessment of the adequacy of the collected data with regard to completeness and accuracy requires a high level of technical competence because of the large number of source categories or processes maintained in the point source file and the possible variability of source and emission data within categories. Assessment is particularly demanding when the data are from sources which are large and complex, difficult to control, or sources of fugitive emissions.

The agency should maintain and update a library of recent technical publications that assess emissions from source categories within the agency's jurisdiction. Over the past few years several source assessment programs and measurement programs designed to assist EPA and states in the development of standards (e.g., NSPS, NESHAP and RACT for VOC sources) have been conducted. Several relevant studies are included in the bibliography Volume V, of this emission inventory preparation series. Although the results of many of these studies will eventually be embodied in AP-42[1] the agency should contact EPA representatives to obtain the most recent and pertinent technical reports as they become available. Information contained in these reports, and in data files such as NEDS[2] and the Environmental Assessment Data System (EADS),[3] will provide guidance to the agency in identifying emission points associated with specific facilities and activities. The EADS data can also be used in many cases to assess the effect of process and control device operating variables on emissions from specific source categories.

Some agencies have developed and maintained source manuals for use by agency personnel responsible for the assessment of inventory data from significant source categories. These manuals typically provide a process description, identify emission points, characterize control device types and performance, define boundary values for process and control device parameters and emission rates, and otherwise provide guidance to agency personnel in their assessment of the data that, if deemed adequate, will be entered into the emission inventory file.

Although an indepth technical description of major source categories and their emissions is not provided in this volume, following discussions will identify some specific problem areas, and possible solutions to them, which are encountered in inventorying emissions from major source categories. These major categories are:

Combustion (including incineration),

Chemical manufacturing,

Food and agriculture,

Metallurgical industries,

Mineral products,

Wood products,

Petroleum industry, and

Evaporation loss sources.

The contribution of major source categories to nationwide emissions is summarized in Table 5-1. The data in this table were taken from the 1977 National Emissions Data Report[4] and represent nationwide totals. Mobile source and combined mobile source and area source totals are also provided in the table to illustrate the relative contributions of each source. Agency files should contain similar summary tables for both the state and its subdivisions. These tables can be used as an indication of the importance of source categories within the agency jurisdiction.

5.1 COMBUSTION SOURCES

Combustion sources include external combustion boilers and internal combustion turbines and reciprocating engines. Uncontrolled emissions will generally exceed 100 tons/yr of any one criteria pollutant for the following combustion systems if operated 8,000 hr/yr.[5]

Coal-fired boilers - 4×10^6 Btu/hr

Residual oil-fired boilers - 13×10^6 Btu/hr

Distillate oil-fired boilers - 70×10^6 Btu/hr

Natural gas-fired boilers - 110×10^6 Btu/hr

Internal combustion - 10×10^6 Btu/hr

The above point source (100 tons/yr) cutoff sizes are approximate values only. Actual values will depend on many factors including fuel characteristics; furnace type, size and age, and load and other operating characteristics. Pollutants of interest from external combustion sources, listed in order of decreasing actual nationwide mass emission rate, are SO_x, particulate and NO_x from coal combustion; SO_x, NO_x and particulate from residual oil combustion; SO_x and NO_x from distillate oil combustion; and NO_x from natural gas combustion.[6] Internal combustion turbines and engines are major sources of NO_x and also can emit appreciable quantities of hydrocarbons and carbon monoxide. Emission factors for internal combustion sources are not as reliable as emission factors for external combustion sources.[6]

TABLE 5-1. CONTRIBUTION OF MAJOR POINT SOURCE CATEGORIES TO NATIONWIDE EMISSION TOTALS

Source category	Pollutant, tons/yr				
	Particulates	Sulfur oxides	Nitrogen oxides	Hydrocarbons	Carbon monoxide
External combustion	3,293,792	23,370,295	9,989,438	288,969	682,155
Electricity generation	2,245,438	19,797,109	7,283,960	95,173	318,585
Industrial	963,233	3,254,725	1,946,437	90,832	253,695
Commercial institutional	68,721	256,282	112,201	6,640	24,537
Internal combustion	16,400	62,179	746,840	96,324	85,338
Industrial process	4,271,750	5,636,837	1,029,549	5,191,860	7,270,791
Chemical manufacturing	249,449	865,179	186,741	1,147,411	2,258,676
Food/agriculture	685,412	3,320	3,249	53,791	2,406
Primary/secondary metals	911,469	2,877,987	79,934	157,979	2,609,737
Mineral products	1,846,725	701,356	232,596	20,419	68,816
Petroleum industry	144,263	978,279	442,212	627,451	1,549,376
Wood products	269,791	158,696	47,587	40,646	731,268
Organic solvent evaporation	16,646	240	4,662	1,607,433	2,402
Petroleum storage	2,761	523	280	1,176,496	192
Total, all point sources	7,692,760	29,036,487	11,057,129	5,593,039	8,607,254
Total, all mobile sources	6,094,037	856,434	9,415,763	12,772,620	97,166,875
Total, all area sources*	45,731,590	2,441,270	10,679,474	22,144,188	105,108,057

*Includes mobile sources.

Source: Reference 4.

The preponderance of air emissions from combustion sources are stack emissions. However, fugitive emissions from coal and ash storage piles and drift from cooling towers are other possible sources of emissions which should be considered by the agency in compiling the combustion source inventory.

Particulate control devices are used on all utility boilers and most industrial boilers burning coal. Overall, only about 10 percent of particulate emissions from oil-fired utility combustion sources are controlled; and no controls are used for natural gas combustion sources. Control measures for SO_x and NO_x emissions from utility boilers have not yet been instituted to any significant extent. However, control measures for these pollutants will be forthcoming due to passage of New Source Performance Standards (NSPS) for utility boilers.

The application of control measures for smaller industrial boilers (nominally 10 - 250 x 10^6 Btu/hr heat input) is far less than that for utility boilers. Overall particulate control efficiencies range from 20 to 50 percent for coal-fired units with efficiency increasing with boiler size. The control devices used are generally mechanical cyclones with efficiencies in the 50 to 90 percent range, in contrast to the high efficiency (>99 percent) electrostatic precipitators used in the utility sector.[6]

5.1.1 EXTERNAL COMBUSTION SOURCES

The emission factors used for large utility boilers are considered adequate for all furnace types (e.g., pulverized units, cyclones and stokers), pollutants, and fuels (with the possible exception of wood-fired boilers). The principal factor affecting the accuracy of particulate emission estimates is the control device efficiency. The sensitivity of emissions to control device efficiency estimates is most pronounced at high efficiencies. An order of magnitude underestimate of emissions can occur, for example, if a control unit with a design efficiency of 99.5 percent is actually operated at an average efficiency of 95 percent. For this reason, the agency should, when possible, use stack test data to determine actual emissions. The use of stack test data, however, provides no assurance that conditions at the time of test were representative of normal plant operation. Records of equipment maintenance and malfunctions and continuous monitoring data should be examined by agency personnel to provide some measure of equipment performance over a long-term basis.

Emissions of SO_x from combustion sources can be accurately estimated for bituminous and anthracite coals, fuel oil and natural gas by assuming that 95 percent of fuel sulfur is emitted as SO_x. Approximately 98 percent of the SO_x is emitted as SO_2, the remainder being SO_3. For coals of high alkali ash content, such as lignite and some western subbituminous coals, the of coal sulfur emitted as SO_x is appreciably less, of the order of 50 percent.[3] The remaining sulfur is bound in the ash. Stack test data will be needed to determine SO_x emissions from coals containing high alkali ash.

Emissions of NO_x from combustion sources are a function of fuel nitrogen content and furnace operating parameters such as temperature and excess air. The AP-42[1] emission factors for utility boilers show the average effect of fuel and furnace type on NO_x emissions. These factors accurately depict NO_x emissions from most efficiently operated utility boilers.

Hydrocarbon and carbon monoxide emissions from well-operated combustion sources are normally not significant. Recent evidence does indicate, however, that inefficiently operated coal- and wood-fired sources can emit potentially significant quantitites of polycyclic organic matter (POM).[6]

Emission factors for smaller nonutility boilers are not as reliable as those for utility boilers due to a smaller emission data base and greater variability in operating parameters for the nonutility boilers. Small boilers tend to be less well maintained and are often subject to frequent startup and shutdowns and low load operational cycles. Generally, particulate and NO_x emissions decrease and hydrocarbon and carbon monoxide emissions increase with decreasing load. However, particulate emissions can increase drastically at load conditions which are well below the normal design load.

In compiling the inventory of external combustion sources, furnace design and fuel type must be clearly distinguished because of the impact of these factors on emissions. Units burning more than one fuel should receive further attention to determine if the fuels are burned separately or dual-fired. Such information can be useful in assessing temporal emission variations and in conducting research programs; e.g., studies of acid rain and SO_2 emissions.

5.1.2 INTERNAL COMBUSTION SOURCES

Emissions from internal combustion sources are a function of unit design, load and fuel. NO_x emissions are significant due to the high temperatures of combustion, and increase with load. Emission factors for CO and HC are appreciably higher than those for external combustion. In the absence of stack test data, the agency must rely on existing emission factor data from AP-42 or data from other EPA test programs.[6]

Electric utility turbines are typically used to generate peak or standby power and generally operate 5 hours per day or less. They may be out of service for days or weeks at a time. Because of variability in operating schedules the maintaining of a permanent record of data on temporal patterns is not of immediate use to the agency. However, the temporal pattern of emissions should be noted and considered by the agency in assessing the data needs of research programs aimed, for example, at studying ozone formation. Unit design (i.e., gas turbines burning gas or oil and reciprocating engines burning gas, oil or any combination thereof) should be clearly distinguished in the inventory.

5.1.3 SOLID WASTE INCINERATION AND OPEN BURNING

Although several solid waste incineration classification systems have been developed, the most frequently used is that provided by NEDS[2] (see Table 5-2). This system describes three major incinerator categories by owner (commercial/institutional, governmental, and industrial). The commercial/institutional category includes hospitals, shopping centers, restaurants, etc. The governmental category covers the incineration of wastes such as sewage sludge and municipal waste. Most municipal waste and sludge incinerators will be point sources. Industrial incinerators are the most diverse, ranging from small units burning general plant trash to large suspension-fired boilers burning over 500 tons of shredded plant trash, product waste and sludge per week. The NEDS system does not include agricultural and mineral waste incineration as separate categories. Agricultural incineration is probably a significant source of emissions in some states and an agricultural/point source incineration category may be merited in those locations.

AP-42[1] provides emission factors for the incineration of municipal, industrial and commercial wastes for several types of incinerators. The emission factors given are average values based on typical waste characteristics.

All questionnaires used to collect point source data from industry should request an accounting of the amount and type of waste burned. Emission factors are not available in AP-42 for agricultural waste and must be obtained from the literature or estimated from existing emission factors for the incineration of other wastes or the open burning of agricultural wastes. Variations in waste will not only directly affect the nature of emissions but will indirectly affect emissions due to the possible effects of waste on incinerator and control device performance. The use of stack test emissions data is preferable to the use of emission factors for calculating emissions. However, if stack data are used, the facility and test organization should be contacted to determine the representativeness of incineration operation during the test period. Engineering judgment will be required to assess the importance of the large number of variables involved in determining representative operation and performance.

5.2 INDUSTRIAL SOURCES

The exceedingly large number of industrial processes to be inventoried is indicated by the industrial source list compiled from AP-42[1] and shown in Table 5-3. This list is not all inclusive of the nationwide industrial base. Although it is not possible to comprehensively discuss the special problems of each of these processes, this section describes some of the more widespread problems that are encountered when inventorying industrial emissions and identifies some techniques for developing inventory information. In addition, specific problems and inventory techniques that are applicable to the major categories of chemical manufacturing, food processing and agriculture, metallurgical processes, mineral products, wood products, the petroleum industry and evaporation loss sources are discussed in somewhat more detail.

TABLE 5-2. NEDS SOURCE CLASSIFICATION CODES FOR INCINERATORS[5]

Solid waste--government		Solid waste--commercial/institutional		Solid waste--industrial	
Municipal Incinerator		Incinerator, general		Incinerator	
5-01-001-01	Multiple chamber	5-02-001-01	Multiple chamber	5-03-001-01	Multiple chamber
5-01-001-02	Single chamber	5-02-001-02	Single chamber	5-03-001-02	Single chamber
		5-02-001-03	Controlled air	5-03-001-03	Controlled air
Incinerator		5-02-001-04	Conical-refuse	5-03-001-04	Conical-refuse
		5-02-001-05	Conical-wood	5-03-001-05	Conical-wood
5-01-005-05	Pathological			5-03-001-06	Open pit
5-01-005-06	Sludge	Apartment incinerator			
5-01-005-07	Conical			Autobody	
5-01-005-99	Other/not classified	5-02-003-01	Flue fed		
		5-02-003-02	Flue fed-modified	5-03-003-01	w/o afterburner
Auxiliary fuel/no emissions				5-03-003-02	w/afterburner
		Incinerator			
5-01-900-04	Residual oil			Railcar burning	
5-01-900-05	Distillate oil	5-02-005-05	Pathological		
5-01-900-06	Natural gas	5-02-005-06	Sludge	5-03-004-01	Open
5-01-900-10	LPG	5-02-005-99	Other/not classified		
5-01-900-97	Other/not classified			Incinerator	
5-01-900-98	Other/not classified	Auxiliary fuel/no emissions			
5-01-900-99	Other/not classified			5-03-005-06	Sludge
		5-02-900-04	Residual oil	5-03-005-99	Other/not classified
		5-02-900-05	Distillate oil		
		5-02-900-06	Natural gas	Auxiliary fuel/no emissions	
		5-02-900-10	LPG		
		5-02-900-97	Other/not classified	5-03-900-04	Residual oil
		5-02-900-98	Other/not classified	5-03-900-05	Distillate oil
		5-92-900-99	Other/not classified	5-03-900-06	Natural gas
				5-03-900-07	Process gas
				5-03-900-10	LPG
				5-03-900-97	Other/not classified
				5-03-900-98	Other/not classified
				5-03-900/98	Other/not classified

TABLE 5-3. INDUSTRIES, EMISSIONS AND CONTROLS

Product/process	Types of emissions expected	Types of controls used
CHEMICAL PROCESS INDUSTRY		
Adipic acid	Co, VOC, NO_x, particulates	Incineration, thermal reduction scrubbers, carbon aabsorbers, flaring
Synthetic ammonia	CO, CO_2, NH_3, NO_x, SO_x, organics	Process modification
Carbon black	CO, NO_x, SO_x, organics, par-lates, trace elements	Gas filter, flare, incineration, scrubber
Charcoal	CO, CO_2, VOC, NO_x, organics,	Afterburner
Chlor-alkali	CO, CO_2, H_2, Hg	Alkaline scrubber, chlorine recovery, process modification
Explosives	Acid mist, NO_x SO_x, particulates	Acid recovery, fume recovery, ESD scrubber
Hydrochloric acid	HCl	Absorption scrubber
Hydrofluoric acid	SO_2 hydrofluoric acid, Florosilic acid particulates	Additives, bag filter, covers, scrubber
Nitric acid	NO_x	Catalytic combustor
Paint and varnish	VOC	Adsorbers, afterburners, condensers
Phosphoric acid	Fluorine, particulates	Condenser, cooling pond, demister, ESP scrubber
Phthalic anhydride	CO, SO_x, particulates	Scrubber, incineration
Plastics	Monomers, solvents	Adsorption, condensers, floating roof tanks
Printing ink	CO_2, organics, particulates	Afterburners, condensers, scrubbers
Soap and detergents	Organics, particulates	Cyclone, scrubber
Sodium carbonate	NH_3, particulates	Ammonia recovery
Sulfuric acid	SO_x, acid mist	Process modification, scrubber
Sulfur recovery	SO_2, H_2S, COS, CS_2	Process modification
Synthetic fibers	CS_2, H_2S, VOC, oil vapor and mist	Adsorption
Synthetic rubber	Monomers, particulates	Fabric filter
Terephthalic acid	NO_x	
Lead alkyl	Alkyl lead vapor, particulate lead oxide	Incineration, scrubber
FOOD AND AGRICULTURE INDUSTRY		
Alfalfa dehydration	Particulates	Cyclone, fabric filter
Coffee roasting	NO_x, organics, particulates	Afterburner
Cotton ginning	Particulates	Cyclone, filter, screen, unifilter
Feed and grain, mills and elevators	Particulates	Cyclone, fabric filter
Fermentation	H_2S, organics	Process modification
Fish processing	H_2S, organics, particulates	Afterburner, cyclone, scrubber

(continued)

TABLE 5-3 (continued)

Products/process	Types of emissions expected	Types of controls used
Meat smokehouses	Organics, particulates	Afterburner, ESP, scrubber
Ammonium nitrate fertilizer	NH_3, NO_x, particulates	Mist eliminator, scrubber, wet cyclone
Phosphate fertilizer	NH_3, SO_x, ammonium chloride, fluoride, hydrogen fluoride, silicon tetrafluoride	Scrubber
Starch manufacture	Particulates	Scrubber
Sugar cane processing	Particulates	
Bread baking	Organics	None
Urea	NH_2, particulates	Condenser, scrubber
Beef cattle feedlots	Ammonia, malodorous gasses, particulates	Housekeeping
Defoliation and harvesting of cotton	Arsenic acid, DEF, paraquat particulates, sodium chlorate	Process modification
Harvesting of grain	Particulates	Process modification
METALLURGICAL INDUSTRY		
Primary aluminum production	VOC, SO_2, alumina, fluorides, hydrogen fluoride, organics, particulates	Alumina adsorption, centrifugal collectors, ESP, multiple cyclones, scrubbers
Metallurgical coke manufacture	CO, VOC, H_2S, NO_x, carbon disulfide, particulates	Process modification
Primary copper smelting	SO_2, particulates	Cyclone, ESP, Fabric filter, scrubber
Ferroalloy production	CO, particulates	Flare or combustion (of CO), particulate control device
Iron and steel production	CO, fluorides, particulates (mainly iron oxide, manganese, aluminum, silicon)	Cyclone, ESP, fabric filter, flaring or combustion (of CO)
Primary lead smelting	SO_2, particulates	Centrifugal collector, ESP, fabric filter, tubular cooler, sulfuric acid plant, sulfur recovery, DMA adsorption process, ammonia adsorption
Zinc smelting	SO_2, particulates	Conversion of SO_2 to sulfuric acid, ESP, fabric filter
Secondary aluminum operations	Fine particulates, chlorine	ESP, fabric filter
Secondary copper smelting and alloying	Particulates	ESP, fabric filter, scrubber
Grey iron foundries	CO, particulates	ESP, fabric filter, scrubber
Secondary lead smelting	SO_2, particulates	Gas settling/cooling chamber cyclone, demister, fabric filter, scrubber
Secondary magnesium smelting	NO_x, SO_x, particulate MgO	
Steel foundries	VOC, NO_x, SO_x, particulates	ESP, fabric filter, scrubber

(continued)

TABLE 5-3 (continued)

Products/process	Types of emissions expected	Types of controls used
Secondary zinc processing	CO, NO_x, particulates	
Storage battery production	Lead, particulates	Fabric filter, scrubber
Lead oxide and pigment production	Lead, particulates	Cyclone, fabric filter, settling chamber
Miscellaneous lead products	HC, particulate lead	ESP, fabric filter, rotoclone, scrubber, process modification
Leadbearing ore crushing and grinding	Lead, particulates	Cyclones, fabric filter, process modification, housekeeping
MINERAL PRODUCTS INDUSTRY		
Asphaltic concrete	Particulates	Cyclone, fabric filter, scrubber, spray tower
Asphalt roofing	Organics, particulates	Afterburner, ESP, filter, scrubber
Bricks and related clay products	NO_x, SO_x, fluorides, particulates	Cyclone, ESP, fabric filter, scrubber
Calcium carbide	CO, SO_x, acetylene, particulates	Scrubber
Castable refractories	Fluorides, particulates	Cyclone, ESP, fabric filter, scrubber
Portland cement	NO_x, SO_x, particulates	ESP, fabric filter, multicyclones
Ceramic clay	NO_x, acid gases, fluoride, particulates	Cyclone, ESP, fabric filter, scrubber, settling chamber
Clay and fly ash sinterings	Particulates	Cyclone, fabric filter, scrubber
Coal cleaning	NO_x, SO_x, organics, particulates	Cyclone, scrubber, water spray
Concrete patching	Particulates	Enclosure
Glass fiber	CO, VOC, NO_x, SO_x, particulates	Afterburner, ESP, fabric filter, incinerator, scrubber, wet handling
Frit	Particulates	Fabric filter, scrubber
Glass	CO, NO_x, SO_x, organics, particulates	ESP, fabric filter, scrubber
Gypsum	Particulates	Cyclone, ESP, fabric filter
Lime	CO, NO_x, SO_x, particulates	Cyclone, multiple cyclone, fabric filter, settling chamber
Mineral wool	SO_x, fluorides, particulates	Afterburner, scrubber
Perlite	Particulates	Fabric filter
Phosphate rock processing	SO_x, fluoride, particulates	ESP, fabric filter, scrubber, process modification
Sand and gravel	Particulates	Water spray
Stone quarrying and processing	Particulates	Cyclone, fabric filter

(continued)

TABLE 5-3 (continued)

Products/process	Types of emission expected	Types of controls used
Coal conversion	Hazardous organics, metal carbonyls, trace elements, toxic gases (CO, H_2S, HC·N, NH_3, COS, CS_2), particulates	Afterburner, ESP, fabric filter, incineration, scrubber, water spray, housekeeping maintenance, process modification
Taconite ore processing	Particulates	Centrifugal collector, cyclone, multiple cyclone, rotoclone, ESP, fabric filter
PETROLEUM INDUSTRY		
Petroleum refining	CO, VOC, NH_3, NO_x, SO_x, aldehydes, cyanides, particulates	Cyclone, ESP, incineration, scrubber, vapor recovery system, process modification, housekeeping maintenance
Natural gas processing	SO_x	Flaring, incineration, process modification
WOOD PRODUCTS INDUSTRY		
Chemical wood pulping	CO, H_2S, SO_x, NO_x, dimethyl disulfide, methyl mercaptan, particulates, dimethyl sulfide	Absorption, ESP, mist eliminator, multiclone, scrubber, process
Pulpboard	Particulates	Not available
Plywood veneer and layout operations	Organics, particulates	Condenser, cyclone
Woodworking waste collection operations	Particulates	Cyclone, fabric filter
EVAPORATION LOSS SOURCES		
Dry cleaning	Volatile organic compounds	Carbon adsorber, incineration
Surface coating	Volatile organic compounds	Carbon adsorber, afterburner
Storage of petroleum liquids	Volatile organic compounds	Pressure tank, variable vapor space tank, fixed or floating roof
Transportation and marketing of petroleum liquids	Volatile organic compounds	Carbon adsorber, condenser
Cutback asphalt, emulsified asphalt, and asphalt cement	Volatile organic compounds	
Solvent degreasing	Volatile organic compounds	Carbon adsorber, condenser cover
Waste solvent recovery	Volatile organic compounds, particulates	Floating roof tank, scrubber, condenser, incineration
Tank and drum cleaning	Volatile organic chemicals	Flare, absorption

Source: EPA Publication AP-42

5.2.1 SPECIAL PROBLEMS

Special problems in developing point source emission inventories include estimating fugitive emissions; accounting for factors influencing emissions such as process variability, equipment malfunctions and upset conditions; and estimating emissions from processes which do not have emission factors. Fugitive emissions from stockpiles, material handling and transfer, process leaks, hoods and roof monitors may represent a substantial portion of actual emissions from many facilities. A list of 19 industrial processes, their major sources of fugitive particulate emissions, and estimates of annual uncontrolled emissions and the percentage of the fugitive contribution to total uncontrolled emissions are shown in Table 5-4.[7] The emission estimates, largely based on process data for various years in 1970, are not supported by extensive test data.[7] They should be used by the agency only to identify sources and provide a rough measure of their potential contribution to emissions from the industrial processes shown.

Variations in emissions due to normal process variability or abnormal conditions of operation can result in greatly increased emissions which can be difficult to quantify. For example, the efficiency of many control devices, such as electrostatic precipitator, cyclonic collectors, condensers, sorption columns and incinerators can be altered appreciably as a result of changes in process, including feedstock changes, which result in flow variations, changes in particle resistivity or other modifications of pollutant and waste streams characteristics, etc. The effect of such changes on efficiency are not always subject to rigorous analysis.

Equipment malfunctions or process upsets can also result in increased emissions and are a recurring problem at some facilities, either because of old or poorly maintained equipment or because of the inherent nature of the process. Such excess emissions are difficult to quantify and require a search of plant records to determine the frequency and duration of excess emissions and the application of sound engineering judgment to estimate their magnitude. The seriousness of the excess emissions problem has resulted in regulatory actions in many states which require facilities to report all incidents of excess emissions to the regulatory agency. However, there can be no guarantee that all incidents are reported.

The agency is likely to identify facilities and processes for which no emission factors have been developed. In inventorying such sources, the agency will request and probably obtain a estimate of the type and quantity of emissions from each operation. To validate this estimate, the agency must obtain from the facility a description of the test procedures used. If the test procedures are not valid or if no estimate is provided, the agency can perform a source test or else require the source to perform a test using accepted procedures. If testing is not possible, emission data obtained from the current literature for processes which are similar to the one in question can be used by experienced agency process technologists and engineers to estimate emissions.

TABLE 5-4. MAJOR SOURCES OF FUGITIVE PARTICULATE EMISSIONS[7]

Industry and total uncontrolled fugitive particulate emissions, Mg/yr (tons/yr)	Major sources of fugitive particulate emissions	Nationwide uncontrolled fugitive particulate emissions by source category		Percent of annual uncontrolled particulate emissions
		Mg/yr	(tons/yr)	
1 Foundries 106,719 (117,872)	Hot metal and slag transfer, casting, and refining	68,856	(76,152)	65
	Metal melting operations	22,436	(24,710)	21
	Core preparation	11,425	(12,584)	11
2. Portland cement 697,589 (768,961)	Loading, unloading and storage	538,937	(594,077)	77
	Crushing, grinding, and screening	127,421	(142,078)	18
3. Minerals and extraction and beneficiation 648,401 (714,096)	Crushing, grinding, and screening	359,013	(395,387)	55
	Transfer and conveying	97,206	(107,056)	15
	Drilling and blasting	76,956	(84,752)	12
	Overburden removal	56,903	(62,668)	9
4. Iron production 99,450 (110,070)	Sintering	67,100	(74,000)	67
	Hot metal and slag, transfer, casting, and refining	31,600	(35,200)	32

(continued)

TABLE 5-4 (continued)

Industry and total uncontrolled fugitive particulate emissions, Mg/yr (tons/yr)	Major sources of fugitive particulate emissions	Nationwide uncontrolled fugitive particulate emissions by source category		Percent of annual uncontrolled particulate emissions
		Mg/yr	(tons/yr)	
5. Secondary lead 4250 (4684)	Hot metal and slag, transfer, casting, and refining	3,384	(3,730)	79
	Reverberatory furnace	594	(656)	14
6. Primary aluminum	Reduction cells	24,620	(27,140)	47
	Transfer and conveying	19,000	(21,000)	36
	Crushing, grinding, and screening	5,310	(5,850)	10
7. Asphaltic concrete 46,845 (51,638)	Transfer and conveying	28,740	(31,680)	61
	Loading, unloading and storage	14,370	(15,840)	31
8. Limestone manufacturing 44,824 (49,410)	Crushing, grinding, and screening	36,388	(40,111)	81
9. Coke manufacturing 131,700 (145,400)	Charging	63,800	(70,400)	48
	Quenching	38,200	(42,200)	29
	Pushing	25,500	(28,100)	19

(continued)

TABLE 5-4 (continued)

Industry and total uncontrolled fugitive particulate emissions, Mg/yr (tons/yr)	Major sources of fugitive particulate emissions	Nationwide uncontrolled fugitive particulate emissions by source category		Percent of annual uncontrolled particulate emissions
		Mg/yr	(tons/yr)	
10. Secondary aluminum 1,808 (1,995)	Fluxing (chlorination)	1,425	(1,575)	79
	Chip (rotary) dryer	223	(245)	12
11. Secondary brass/bronze 766 (842)	Metal melting	358	(393)	47
	Insulation burning	275	(303)	36
	Rotary dryer	69	(76)	9
12. Secondary zinc 429 (472)	Metal melting	290	(319)	66
	Crushing, grinding, and screening	138	(152)	32
13. Lumber and furniture 8,665 (9,549)	Sawing	7,078	(7,802)	82
	Log debarking	544	(599)	6
	Wood waste storage and unloading	425	(468)	5
14. Concrete batching 31,026 (34,200)	Loading, unloading, and storage	31,026	(34,200)	100

(continued)

TABLE 5-4 (continued)

Industry and total uncontrolled fugitive particulate emissions, Mg/yr (tons/yr)	Major sources of fugitive particulate emissions	Nationwide uncontrolled fugitive particulate emissions by source category		Percent of annual uncontrolled particulate emissions
		Mg/yr	(tons/yr)	
15. Primary copper 19,977 (22,024)	Metal melting	18,153	(20,675)	94
16. Grain elevators 1,238,127 (1,364,803)	Headhouse (legs)	602,368	(663,996)	49
	Transfer and conveying,	378,868	(417,631)	31
	Loading, unloading, and storage	177,704	(195,887)	14
17. Primary zinc 1,806 (1,991)	Hot metal and slag transfer, casting, and refining	1,198	(1,321)	66
	Sintering	608	(670)	34
18. Primary lead 11,742 (12,945)	Sintering	6,978	(7,689)	59
	Metal melting	2,326	(2,566)	20
	Crushing, grinding, and screening	692	(763)	6
	Silver retort building			

(continued)

TABLE 5-4 (continued)

Industry and total uncontrolled fugitive particulate emissions, Mg/yr (tons/yr)	Major sources of fugitive particulate emissions	Nationwide uncontrolled fugitive particulate emissions by source category		Percent of annual uncontrolled particulate emissions
		Mg/yr	(tons/yr)	
19. Steel manufacturing 61,520 (68,250)	Metal melting	51,600	(57,300)	84
	Hot metal and slag transfer, casting, and refining	9,600	(10,600)	15

5.2.2 SPECIAL TECHNIQUES

There are several approaches that are useful to the agency in developing solutions to difficult inventorying problems. These include:

1. Review of special studies by the EPA and others,

2. Review of a rapidly growing base of stack test data,

3. Mass balance calculations, and

4. More effective use of questionnaires.

Consultation with industrial and control system experts may also provide, or suggest solutions, to particularly difficult inventorying problems. These people can be identified by directly contacting authors or EPA offices that have produced reports on related topics.

EPA is involved in a great number of special studies in support of new control technology, regulatory development, etc. The following programs* are sources of industry-specific emission data:

1. New Source Performance Studies (NSPS) conducted prior to the promulgation of NSPS.

2. Control Techniques Guideline (CTG) studies in support of Reasonably Available Control Technology (RACT) for volatile organic compounds.

3. Source Assessment and other EPA studies aimed at relating process parameters to emissions for specific industrial processes.

4. Proceedings of conferences sponsored by EPA, the Air Pollution Control Association (APCA), and other ecological organizations.

Stack test data from similar processes at other locations may be available from EPA or other state agencies and used to estimate emission for sources within the agency's jurisdiction. Care should be exercised to ensure that the effects of all process differences between the two locations have been taken into account prior to using the stack test data to estimate emissions. The Environmental Assessment Data System (EADS),[3] developed by EPA's Industrial Environmental Research Lab, Research Triangle Park, NC, 27711, is a rapidly growing data base which contains detailed field

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*Further information concerning these data sources can be obtained from the Office of Air Quality Planning and Standards and the Office of Research and Development, U.S. Environmental Protection Agency, Research Triangle Park, NC, 27711. EPA Regional Offices, also should be able to provide assistance to the agency in obtaining pertinent efficiencies.

measurement information. The EADS representative at IERL/RTP should be contacted to obtain stack test data from specific industrial categories.

In some cases it is possible to use the material balance to calculate mass emissions to the atmosphere. Mass balance calculations, however, are susceptible to error in those instances where a minor error in the calculation of a large mass (the input or product components) will have a major impact on the small value (loss) being calculated; e.g., storage tanks losses.

Questionnaires of either an industry-specific or "catch all" type are regularly used to collect much of the information needed from industrial point sources (see Subsection 2.3.1). Source specific questionnaires should be used to collect data from small operations such as grain elevators, small printing plants, asphalt batch plants, etc., involving in most cases a singular process. These questionnaires are easy to design by the agency and they should be easy for the facility to fill out. For large, complex industrial facilities the general questionnaire is best. A questionnaire should be accompanied by a set of supplementary instructions in which examples of typical process/operating units, feed materials, products and major activities are listed. Appendix B provides a list of examples used by the EPA (EPA Form 3520-4A, 9-78).[8] These examples can be used as a guide for industry personnel filling out the form.

5.2.3 CHEMICAL PROCESS INDUSTRY

The chemical process industry consists of a wide variety of facilities producing a multitude of products. Individual facilities may produce several products, operate several interconnected unit operations and have numerous emission points.

A tabulation of some of the major activities, process/operating units, feed materials used and types of products produced by the chemical process industry is provided in Appendix B on page B-7. Although not a complete list, this table does identify some raw materials, processes and products of the industry. Typical emissions, along with usual control systems, used in 22 segments of the industry are presented in Table 5-3. The majority of emissions from the chemical process industry are gas phase emissions and are often controlled by incineration, adsorption and absorption. Combinations of control equipment are sometimes used where several types of pollutants must be removed from the waste gas stream or where a high collection efficiency is needed. Pollution control in this industry is often economically advantageous, as many constitutents of the emissions can be recovered and recycled into the process.[1]

Special problems in the chemical process industry are often related to the complexity of the processes and the manner in which emission streams are treated. Fugitive VOC emissions from synthetic organic chemical manufacturing are also a problem.[9] A great deal of time and effort will be required to identify all emission points and estimate total emission rates from a complex process with several individual operations. In many operations several

processes may be ducted to a single stack, making it difficult to assign emission rates to each specific process. The agency questionnaire should request that this information be provided in sufficient detail to accurately explain the relationships among the various processes.

Emission factors for the 22 segments of the chemical process industry listed in Table 5-3 are provided in AP-42. Because the emission factors for some of these processes are based on limited data or were estimated using material balances derived for similar processes, the reliability of emission estimates based on the use of these factors is generally low. However, the mass balance technique may be more amenable to chemical process sources than other sources, because some manufacturers routinely calculate losses with a high degree of accuracy.

5.2.4 FOOD AND AGRICULTURE INDUSTRY

Examples of some of the processes, operating units, products and feed materials used in the food and agriculture industry are listed in Appendix B, page B-16. Several steps are often involved in transforming the raw materials into consumer products, many of which create emissions. For most segments of this industry the primary concern is with particulate emissions. Cyclones, baghouse filters and scrubbers are therefore the principal devices used to control emissions.

If stack test data are unavailable, emissions must be estimated, usually by comparison with a similar process. Comparison with operations for which emission factors are available may lead to inaccurate estimates, however. For example, particulate emissions from a grain elevator storing wheat will vary with the type of wheat stored and duration of storage. As a result, emission factors may not be accurate when applied to specific facilities or localities. When AP-42 emission factors are unavailable or of high uncertainty, the agency should attempt to locate more reliable data as described in Subsection 5.2.2.

5.2.5 METALLURGICAL INDUSTRY

Examples of processes, operating units, feed materials and products of the metallurgical industry are given in Appendix B, page B-14. The majority of air pollutants result from various furnace operations. Table 5-3 lists the types of emissions expected and pollution controls used in 18 segments of the metallurgical industry. Effluent pollutants consist primarily of submicron dusts and fumes resulting from the vaporization and condensation of charge materials. Impurities present in the charge such as grease and oil can lead to increased emissions of both particulate and organics. Combustion products will also be present in the gas stream when a fuel-burning furnace is used. Fluoride is emitted from primary aluminum and steel production processes in both particulate and gaseous form, thereby creating a difficult control problem.[9]

Pollution control equipment used with furnaces must be capable of operating at elevated temperatures and providing reasonable control efficiency for submicron particulates. Control devices meeting these requirements include ESPs, scrubbers, and baghouse filters using glass fiber fabrics or some other high temparaturic fabric.[10]

There are several potential sources of fugitive emissions in the metallurgical industry. Process sources such as furnaces and open sources such as storage piles and raw materials handling operations can result in significant particulate emission. A ranking of emission points within steel mills is shown in Table 5-5. While it is recognized that fugitive emissions may constitute a large percentage of the total particulate emissions, very few studies have provided quantitative emission data. Emission factors developed for process sources of fugitives are often estimates rather than measured values. As a result, the reliability of emission estimates based on these factors is low. Emission factors for open sources are particularly lacking with appreciably more sampling and analysis data being necessary to establish such factors.[11] In the absence of specific stack test or emission factor data, the agency should review the technical literature. EPA has conducted and is presently conducting several studies of emissions from the metallurgical industry. References 11, 12, and 13 are examples of studies which will be of value to the agency in assessing emissions from the various sources of fugitive emissions.

5.2.6 MINERAL PRODUCTS INDUSTRY

The mineral products industry consists of a broad range of processes used to produce numerous nonmetallic products. A description of many of the process and operating units used, feed materials used, and products produced are presented in Appendix B, page B-13, while Table 5-3 lists the types of emissions which can be expected and typical controls used in 21 segments of the industry.

Most emissions in the mineral product industry are particulates resulting from quarrying; material storage; and transfer, drying, crushing, screening, conveying, and packaging operations. Since emissions are produced primarily by mechanical wear, they are in most cases identical chemically to the parent material.[1]

Control systems for drilling, transport, crushing, screening and packaging operations typically include hood capture ducted to a fabric filter or cyclone. Wet suppression is used whenever possible, particularly during quarrying where it is often the only method of control used. Emission factors for the 21 industry segments listed in Table 5-3 have been established and are presented in AP-42.[1] The accuracy of these factors may be affected by the rate at which material is processed, the method of transfer, the moisture content of raw material, and the degree of enclosure of transfer points, processes, and storage areas. In addition, excess emissions are often caused by overloading process equipment such as kilns, dryers, and furnaces which resulting in higher gas velocities through pollution control equipment and a high frequency of breakdown or malfunction.

TABLE 5-5. STEEL MILL SOURCE PRIORITY RANKING FOR PARTICULATE EMISSIONS

		Model plant lb/hr	Industry total tons/yr[a]
1.	Coke quenching	283	38,000
2.	Blast furnace casthouse	156	25,000
3.	BOF stack	143	22,000
4.	Material stockpiles	120	18,000
5.	Roadway travel	118	18,000
6.	Coke combustion stack	110	18,000
7.	BOF charge and tap	97	16,000
8.	Coke pushing	62	9,800
9.	Sinter, misc. fugitives	64	9,600
10.	Sinter windbox	60	9,000
11.	EAF charge, tap, slag	54	8,400
12.	Coal preparation	52	8,200
13.	Open hearth stack	50	8,000
14.	Coke door leaks	49	7,800
15.	EAF stack	46	7,300
16.	Sinter discharge end	42	6,300
17.	Blast furnace top	26	4,100
18.	Ore screening	25	3,600
19.	Teeming	18	4,100
20.	BOF misc. fugitives	15	2,400
21.	Coke topside leaks	14	2,300

(continued)

TABLE 5-5 (continued)

	Model plant lb/hr	Industry total tons/yr
22. Coal charging	14	2,000
23. Reheat furnaces	13	2,200
24. Blast furnace combustion	12	2,000
25. Open hearth roof monitor	12	2,000
26. Open area	8	1,200
27. Machine scarfing	5	740
28. BOF hot metal transfer	4	720
29. Open hearth misc. fugitives	4	700
30. Soaking pits	3	630
31. EAF misc. fugitives	4	600
32. Open hearth hot metal transfer	4	210

[a]Tons per year--multiply by 0.9078 to obtain metric tons/yr (1000 kg).

BOF--Basic Oxygen Furnace
EAF--Electric Arc Furnace

Source: Development of Inhalable Particulate Emission Factors for Ferrous Metallurgical Sources, Program Overview Paper, Peer Review for Metallurgical Process Branch, IERL, U.S. EPA, February 19, 1981.

5.2.7 WOOD PRODUCTS INDUSTRY

Operations that make up the wood products industry include timber harvesting and transportation, saw mills and planing mills, veneer and plywood mills, hardboard and insulation board mills, particle board mills, pulp and paper mills and whole wood products. Four segments of the industry which can cause significant emissions are listed in Table 5-3. A description of the major process/operating units, feed materials, and products produced by the industry are presented in Appendix B, pages B-9 and B-17.

Pulping is accomplished by one of three processes: Kraft pulping, acid sulfite pulping, and neutral sulfite pulping, each producing different amounts and types of emissions. Emissions consist mainly of particulates and various sulfur compounds with scrubbers being the most common control device used. Emission factors are presented in AP-42[1] for the Kraft and acid sulfite processes. Emission factors for the neutral sulfite process are not provided. Several EPA studies, which report pulp and paper mill emission data, are available to the agency. The proceedings of annual Technical Association of the Pulp and Paper Industry (TAPPI) conferences also provide emission data.

Emissions generated from plywood, veneer and layout, and woodworking waste collection operations consist mainly of particulates. A simple cyclone is generally considered an adequate control method due to the relatively large particle size (generally greater than 10 μm), while baghouse filters can be used to capture essentially all of the emissions. Emission factors for fugitive sources of particulates from plywood, veneer and layout operations and for cyclone-controlled woodworking operations are provided in AP-42.[1]

Organic compounds are also emitted from veneer drying operations, the condensable fraction of which can be recovered by condensation. Emission factors are dependent upon the type of wood used and are so presented in AP-42.[1]

5.2.8 PETROLEUM INDUSTRY

The petroleum industry consists of crude oil and natural gas production, petroleum refining and natural gas processing. Major activities, processes and operating units typical of the petroleum industry are presented in Appendix B, page B-4. Table 5-3 lists emissions which can be expected and typical controls used by the industry.

Air contaminants emitted from crude oil and natural gas production consist chiefly of light saturated hydrocarbons. Hydrogen sulfide gas may also be emitted in some production areas. The principal emission sources are process equipment (well drilling and pumping) and storage vessels. Internal combustion engines, mostly natural gas-fired compressors, are also a source of emissions. Acceptable control methods for drilling and pumping operations include smokeless flares and general maintenance procedures. AP-42 does not contain emission factors for drilling and pumping.

In refining, petroleum crude oil is converted into more than 2500 products. Major potential refining emissions include hydrocarbons, sulfur oxides, carbon monoxide, nitrogen oxides, particulate matter, aldehydes and ammonia. Major emission sources include vacuum distillation, catalytic cracking, thermal cracking, utility boilers, heaters, compressor engines, blowdown and sulfur recovery systems. In addition, fugitive emissions consisting mainly of hydrocarbons and sulfur compounds are emitted from wastewater systems, cooling towers, pipeline fittings, relief valves, pump and compressor seals, asphalt blowing, sweetening, storage and transfer operations.[1]

Emissions are largely dependent upon production capacity, the type of crude oil processed, type and complexity of the processing employed, air pollution control measures in use, and the degree to which maintenance and good housekeeping practices are used. Emission factors for many, but not all, petroleum refinery operations are provided in AP-42.[1] Emission factors are also provided for many uncontrolled sources of fugitive hydrocarbon emissions. The agency should obtain additional fugutive emission data from recent or current EPA studies as discussed in Subsection 5.2.2.

Natural gas is often processed to remove contaminants. Field separators are used to remove hydrocarbon condensate and water at the well. Hydrogen sulfide must be removed in a gas sweetening plant if the concentration is greater than 0.25 grains/100 standard cubic feet. In approximately 95 percent of the plants in the U.S., hydrogen sulfide is removed by absorption in an amine solution. Emission factor for amine process gas sweetening plants, using smokeless flares or incinerator controls are provided in AP-42.[1]

5.2.9 EVAPORATION LOSS SOURCES

Evaporation loss sources of concern are those producing volatile organic compound (VOC) emissions. A list of eight major sources of VOC emissions along with typical pollution controls used is shown in Table 5-3 Emission sources include organic solvents emitted from dry cleaning, surface coating and degreasing operations in addition to volatile organics emitted from petroleum products. A description of the processes from which organic solvents may be emitted, the feed materials commonly used, and the products produced are given in Appendix B, page B-8.

Carbon adsorption, condensation and incineration are the primary methods of controlling VOC emissions from many operations emitting solvents. Control efficiency for carbon adsorption systems properly designed and maintained are in excess of 90 percent. However, poor maintenance and improper operation of equipment may result in excess emissions. In addition, leaky pipes, flanges and pumps can also be significant sources of fugitive emissions.[14] Solvent recovery by both carbon adsorption and condensation may have economic benefits depending on the type and amount of solvent used. Emission factors for controls and uncontrolled dry cleaning operations are provided in AP-42[1] along with emission factors for surface coating operations.

Methods used to control emissions from petroleum storage include using fixed roofs, floating roofs, variable vapor space tanks, and pressure tanks. Emissions are generated through fixed roof breathing and working losses, floating roof standing storage losses, floating roof withdrawal losses, variable vapor space filling losses, and pressure tank losses. Loading operations, potentially a major source of emissions, are effectively controlled by carbon adsorption and condensation with efficiencies in excess of 90 percent. Emission factors for storage facilities are provided in AP-42.

For many sources of VOC emission, the best method of estimating emissions from solvent evaporation is the mass balance. In this case, it is assumed that all of the solvent used in a process evaporates into the atmosphere. Therefore, the only information needed to calculate emissions is the amount of solvent purchased over the time interval of concern, with emissions being equal to the quantity of solvent purchased less any solvent returned to reprocessors.[15]

References for Chapter 5.0

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5. Preliminary Emissions Assessment of Conventional Combustion Systems, Volume II, EPA-600/2-76-046b, U.S. Environmental Protection Agency, Research Triangle Park, NC, March 1976.

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7. Assessment of Fugitive Particulate Emission Factors for Industrial Processes, EPA-450/3-78-107, U.S. Environmental Protection Agency, Research Triangle Park, NC, September 1978.

8. EPA Form 3520-4 (9-78): OMB No. 158- R0075.

9. Guideline Series--Control of Volatile Organic Fugitive Emissions from Synthetic Organic Chemical, Polymer, and Resin Manufacturing Equipment, Preliminay Draft, prepared for Emissions Standards and Engineering Division, Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Contract No. 68-02-3168, January 1981.

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11. Fugitive Emissions From Integrated Iron and Steel Plants, EPA-600/2-78-050, U.S. Environmental Protection Agency, Research Triangle Park, NC, March 1978.

12. Particulate Emission Factors Applicable to the Iron and Steel Industry, EPA-450/4-79-028, U.S. Environmental Protection Agency, Research Triangle Park, NC, August 1979.

13. Operation and Maintenance of Particulate Control Devices on Selected Steel and Ferroalloy Processes, EPA-600/2-78-037, U.S. Environmental Protection Agency, Cincinnati, OH, March 1978.

14. Guide for Lowest Achievable Emission Rates from 18 Major Stationary Sources of Particulate, Nitrogen Oxides, Sulfur Dioxide, or Volatile Organic Compounds, EPA-450/3-79-024, U.S. Environmental Protection Agency, Cincinnati, OH, April 1979.

15. Procedures for the Preparation of Emission Inventories for Volatile Organic Compounds, Volume I, Second Edition, EPA-450/4-79-028, U.S. Environmental Protection Agency, Research Triangle Park, NC, September 1980.

APPENDIX A

GENERAL INSTRUCTIONS TO THE APER FORM

EPA Form 3520-4A (9-78)

ENVIRONMENTAL PROTECTION AGENCY
AIR POLLUTANT EMISSIONS REPORT

I. BACKGROUND

The Air Pollutant Emissions Report (APER) form is a comprehensive vehicle for obtaining operational and emissions data from a wide variety of industrial and commercial sources. The APER has been organized into separate sections as follows:

Section	Title	Purpose
I	GENERAL INFORMATION	Basic source identification data.
II	MAJOR ACTIVITY THROUGHPUTS	Operating capacity of major activities.
III	FACILITY INTERRELATIONSHIPS	Inter connection of process/operating units, air cleaning equipment, and stacks and vents at the facility.
IV	PROCESS/OPERATING DATA	
	Part 1 General Information	Unit description and operation data.
	Part 2 Input/Output Information.	Feed material and product throughput data.
	Part 3 Fuel Usage Information	Fuel usage of combustion units.
V	EMISSIONS DATA	Quantity of emissions into the atmosphere of each pollutant from each source.
VI	AIR CLEANING EQUIPMENT	Specifications for all air cleaning equipment units.
VII	STACKS AND VENTS	Characteristics of all pollutant emission points.
VIII	STORAGE TANK DATA	Characteristics and specifications of all organic liquid storage facilities.
IX	SOLVENT USAGE INFORMATION	Solvent identification, recovery and disposal data.

The questionnaire requests data to be supplied for major activities (Section II) and for process/operating units (Sections III and IV). A major activity is an independent procedure that transforms raw material inputs into finished products. In industries such as petroleum refining and chemical production, major activities may relate to the output of the intermediate products.

Process/operating units consist of one or more pieces of equipment which convert initial or intermediate inputs into intermediate or final outputs, or are involved with materials handling or storage operations. Each process/operating unit has the potential to be a source of air pollution emissions.

EPA Form 3520-4A (9-78)

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I. BACKGROUND (Cont'd)

The APER instructions have been arranged in two segments. The first segment provides detailed guidelines for completing the entire questionnaire. These instructions have been prepared to assist you in completing the form by explaining the data requested in each item. The second segment deals with the characteristics of specific industrial and non-industrial categories by providing examples of process/operating units, input materials and output products, and units of measure. These supplemental instructions are designed to assist you in completing the APER in those situations unique to a particular industry or category. They can also provide aid in helping you to differentiate between major activities and process/operating units.

II. COMPLETING THE FORM

If no pollutants are emitted at your facility, then only Section I of the form need be completed. If any of the pollutants listed in the cover letter are emitted, then the entire questionnaire must be filled out. In either case, the individual responsible for completing the APER must sign it.

Each respondent reporting on pollutant emissions should complete all sections of the form for which he has information. Every effort should be made to determine the required data and guessing should be avoided.

Section VIII, STORAGE TANK DATA must be completed for any facility in which organic liquids are stored. Additionally, Section IX, SOLVENT USAGE INFORMATION, must be filled out if the facility uses solvent or it employs a feed material containing solvent.

If all data for a given section of the APER cannot be listed on each sheet, use additional copies of the required section. The number of sheets used should be indicated in the upper right-hand corner where "PAGE OF " is shown. This designation refers to the pages of a given section and not the entire APER. Therefore, if you had four major activities in Section II, the forms should contain PAGE 1 OF 4 through PAGE 4 OF 4. If additional copies are not available from EPA, please use copies of the original form.

In certain instances, it may not be possible to enter all the relevant information for a given item in the space provided. In these situations, it is acceptable to use the same space on the next line for the additional data. However, be careful to list each new identification number or code on an empty line to avoid confusion.

It is important to distinguish between data values which are zero, and those that are unknown or blank. Accordingly, if an item has a zero value, be certain to clearly write "0" in the appropriate space. If the data item does not apply to your situation, indicate this by entering "N/A" for not applicable. A blank response should be used when the information requested is unknown.

In the upper left part of each page, list the date this page of the APER is submitted. Pages two through eleven ask that the facility name be shown in the upper right-hand corner. This information should not be overlooked.

On pages two through eleven, usually in the first column on each sheet, you are requested to supply an identification number or code for each process/operating unit, air cleaning device and stack or vent. Please use your own internal code for identifying these units, if such an ID exists. Otherwise, make specific assignments of numbers or codes and ensure that the same number of code is used throughout the APER to refer to the item to which it was originally assigned.

II. COMPLETING THE FORM (Cont'd)

In many instances the APER requests that data elements be provided in specific units of measure. Please adhere to these specifications wherever possible. If the required information is not available in the requested units of measure, other units may be used. However, these units should be clearly identified on the form. In other instances, specific units have not been indicated, and you are urged to use the most appropriate measure. In either case, the size of specific industry measures such as petroleum barrels and cotton bales *must* be clearly defined in standard units (lbs, gals, etc.) to prevent any misunderstandings. These measures can be defined in the space available at the bottom of the form in Sections IV through IX.

III. GENERAL INSTRUCTIONS

The detailed general instructions for completing the APER are as follows:

SECTION I. GENERAL INFORMATION

1. *Facility Name* – Provide full legal name under which business is being conducted.

2. *Facility Address* – Complete address or exact location at which business is being conducted. Do *not* use post office box numbers.

3. *County* – County in which facility is located.

4. *Mailing Address* – Complete address to which all mail for this facility is sent. Post office boxes *may* be used. Be sure to include the correct zip code.

5. *Facility Contact* – Name of responsible facility manager who can be contacted for additional data concerning operations at the facility.

6. *Position* – Title or position of the Facility Contact.

7. *Telephone Number* – Telephone number of the Facility Contact. Be certain to include the area code.

8. *Parent Company Name* - If organization operating the facility is a subsidiary or division of another firm, give full legal name of parent company.

9. *Parent Company Mailing Address* – Complete mailing address of main office of parent company.

10. *Parent Company Contact* – Name of individual in the parent company responsible for operation of the subsidiary or division.

11. *Position* – Title or position of parent company contact.

12. *Telephone Number* – Telephone number of parent company contact. Be sure to include area code.

13. *Calendar Year of Record* – Calendar year for which data is being provided. All data should be representative of operations that occurred during the most recent calendar year.

III. GENERAL INSTRUCTIONS (Cont'd)

14. *Land Area in Acres* – Size of lot at which facility is located.

15. *Elevation Above Mean Sea Level* – Mean elevation above mean sea level of lot at which facility is located.

16. *Number of Employees* – Approximate number of employees at location specified in (2) above at end of calendar year of record.

17. *Principal SIC Code* – List the principal SIC code describing the operations at this facility, *if known.*

18. *Principal Products* – List principal products produced or services performed at this facility.

19. *Construction Start Date* – Month, day and year that a contract was signed to undertake and complete a continuous program of construction or modification of the entire plant or facility; *or* the month, day and year the initial work actually began if no contract was signed.

20. *Operation Start Date* – Month, day and year the plant or facility began operations.

21. *Sketches* – Provide sketches or diagrams depicting each of the following items for which check marks were placed in the associated boxes.

    a) Plant or facility location – Show nearest cross streets, roads or landmarks and indicate the north direction.

    b) Plant layout – Denote the location of all structures, buildings and major activity work areas. Indicate the north direction. Locate each source of pollution separated by 50 yards or more and show its internal identification code.

    c) Process flow for entire facility – Illustrate the material flow relationships among the major activities using a simple block diagram, not to exceed one page.

    d) Process flow for each major activity – Illustrate the material flow relationships among the process/operating units, air cleaning equipment, and stacks and vents. Be certain to identify all items by the proper internal identification codes.

    If a facility is small, it may be possible to combine figures 21a and 21b into one diagram.

    If a facility has only one major activity, the process flow sketches defined in 21c and 21d may be combined into one diagram.

22. *Signature* – Signoff of responder to the questionnaire.

    a) Complete this item *only* if the other sections of this questionnaire *do not* apply due to a lack of emissions of the designated pollutants. List these pollutants and sign and give your title where indicated.

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III. GENERAL INSTRUCTIONS (Cont'd)

b) Complete this item *only* if other sections of this questionnaire must be completed. List the pollutants that apply to your facility, sign the form and give your title where requested.

SECTION II. MAJOR ACTIVITY

The page containing Sections II and III provides information for one major activity only. Use separate pages for each major activity.

1. *Description of Major Activity* – Describe in a few words, the activity being performed at the facility. This explanation should relate to the products made or the services performed.

2. *Construction Start Date* – Month, day and year that a contract was signed to undertake and complete a continuous program of construction or modification of the major activity facility; *or* the month, day and year the initial work actually began if no contract was signed.

3. *Operation Start Date* – Month, day and year that activity operations began.

4.* *Major Activity Product* – List major products resulting from this major activity or the materials being processed.

5.* *Maximum Operating Capacity* – Indicate the maximum amount of each product that the facility can produce or the amount of material that can be processed.

a) Annual – Rate of annual production during calendar year of record; include units of measure.

b) Hourly – Rate of hourly production during calendar year of record; include units of measure.

SECTION III. FACILITY INTERRELATIONSHIPS

The Facility Interrelationships Section should be utilized to indicate how process/operating units, air cleaning equipment and stacks and vents are interconnected. On each line, space has been provided to list by identification code: one process/operating unit (Item 1), two units of air cleaning equipment (Items 2a and b) and three stacks and vents (Items 3a, b and c). There is no need to describe these units in this section. Descriptions are requested in later segments of the APER. At this point you are only being asked to indicate how your units are related to each other. If more space is required for additional air cleaning devices or stacks and vents handling the emissions from a given process/operating unit, the next line should be used. Figure 1 indicates how this form should be completed, and the following describes its interpretation:

a) Process/operating unit PP01 is serviced by control devices CC01 and CC02, and causes emissions via stacks and vents SS01, SS02, and VV01.

* Items 4 and 5 appear on both halves of the form to allow for the listing of six major activity products.

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SECTION III. FACILITY INTERRELATIONSHIPS (Cont'd)

b) Process/operating unit PP02 is serviced by control devices CC03, CC04 and CC05, and by stacks and vents SS03 and VV02.

c) Process/operating unit PP03 is also controlled by device CC04 as well as device CC06, and emissions exit through stack SS03.

Table 1 provides a general listing of process/operating units and air cleaning equipment. For examples of specific units that relate to given industries, see the supplemental instructions for that industry.

SECTION IV. PROCESS/OPERATING DATA

Section IV requests information concerning each process/operating unit at the facility including those units that are on standby. Data are requested concerning the general characteristics of the unit, its inputs and outputs, and all the fuels it burns. The same identification codes that were listed in Section III.1 should be included here.

Part 1. General Information

Part 1 of the Process/Operating Data Section requests general information for all process/operating units.

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY

Form Approved
OMB No. 158-R0075

PAGE ___ OF ___

DATE REPORT SUBMITTED

FACILITY NAME

AIR POLLUTANT EMISSIONS REPORT *(APER)*

SECTION II – MAJOR ACTIVITY THROUGHPUTS

1. DESCRIPTION OF MAJOR ACTIVITY				2. CONSTRUCTION START DATE	3. OPERATION START DATE
4. MAJOR ACTIVITY PRODUCT	5. MAXIMUM OPERATING CAPACITY a. ANNUAL	b. HOURLY	4. MAJOR ACTIVITY PRODUCT	5. MAXIMUM OPERATING CAPACITY a. ANNUAL	b. HOURLY

SECTION III – FACILITY INTERRELATIONSHIPS

	1. PROCESS/OPERATING UNIT INTERNAL ID CODE	2. AIR CLEANING EQUIPMENT INTERNAL ID CODES a. ITEM I	b. ITEM II	3. INTERNAL ID CODES OF STACKS AND VENTS a. ITEM I	b. ITEM II	c. ITEM III
a)	PP01	CC01	CC02	SS01	SS02	VV01
b)	PP02	CC04	CC05	SS03	VV02	
		CC03				
c)	PP03	CC04	CC06	SS03		

The FACILITY INTERRELATIONSHIPS SECTION should be utilized to indicate how process/operating units, air cleaning equipment, and stacks and vents are connected within each major activity in the facility. The columns headed by ITEM I, ITEM II and ITEM III are for listing more than one device in each category and do not have any ordering or preference connotation. The Internal ID Codes listed in Section III should also appear on the sketches submitted for SECTION I, ITEM 21d, Process Flow for each major activity at the facility.

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Figure 1

Table 1. EXAMPLES OF PROCESS/OPERATING UNITS AND AIR CLEANING EQUIPMENT

PROCESS/OPERATING UNITS		AIR CLEANING EQUIPMENT
Procurement Handling	Process Units	Particulates
Surface Mine Quarry, Excavation Harvester Solids Storage Method Conveyor, Hopper Elevator Pipeline Pneumatics	Crusher, Grinder, Mill Saw, Chipper, Sander Blender, Miser Separator Melter, Smelter Dryer, Calciner Smoker, Renderer, Cooker Converter, Refiner Fractionator, Oxidizer Polymerizer Reactor Impregnator, Soaker Surface Coater Evaporator, Condenser Furnace	Baghouse Cyclone Separator Spray Chamber Wet Scrubber Dry Electrostatic Precipitator (ESP) Wet ESP Settling Chamber Filter Venturi Scrubber Impingement Separator
Combustion Units		Vapors
Boiler Incinerator* Heater, Burner Engines		Absorber Adsorber Afterburner Condensor Scrubber Vapor Balance Transfer System
Evaporative Units		
Storage Tanks Mixing Tanks Miscellaneous Open Tanks Solvent Operations		

*Include incinerator only if it uses an indirect heat exchanger. Direct flame units are to be shown under Air Cleaning Equipment in Section VI.

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SECTION IV. PROCESS/OPERATING DATA (Cont'd)

1. *Internal ID Code of Process/Operating Unit* – List the internal identification (ID) codes of all process/operating units at the facility. Include units used in the transfer of raw materials and for space heating.

2. *Description of Process/Operating Unit* – Provide a brief description of each process/operating unit at the facility. Sample descriptions are listed in Table 1. For examples that are representative of your specific industry, please see the supplemental instructions.

3. *SCC (Source Classification Code)* Enter the most appropriate SCC for your facility, *if it is known.* The complete SCC list is published by EPA in AP-42, "Compilation of Air Pollution Emission Factors."

4. *Operational Dates* Provide the appropriate dates only if they fall after August 17, 1971, *unless* they are specially requested in the cover letter to this form.

   a) Construction Began: Indicate the month, day and year that a contract was signed to undertake and complete a continuous program of construction or modification to the process/operating unit; or the month, day and year that work actually began if no contract was signed.

   b) In-Service: List the month, day and year the process/operating unit began operations.

5. *Operating Schedule*

   a) Hours/Day: Give the normal operating hours per day.

   b) Days/Week: Provide the normal operating days per week.

   c) Weeks/year: Enter the actual number of weeks of operation during the calendar year of record.

   d) Hours/Year: Provide the actual number of hours of operation during the calendar year of record.

6. *Process Seasonal Throughput (%)* Enter the annual throughput percentage for each of the seasonal quarters, as shown. These quarters are based on seasons of the year and are not calendar quarters. "December" in Item 6a refers to the year prior to the "Calendar Year of Record" listed in Section I, Item 13.

   a) December–February (Winter)
   b) March–May (Spring)
   c) June–August (Summer)
   d) September–November (Fall)

Part 2. Input/Output Information

Part 2 of the Process/Operating Data requests feed and product throughput data for all units except those having to do exclusively with fuel usage. Units used for the cleaning of fuels are to be included in this section.

1. Internal ID Code of Process/Operating Unit – Enter the internal identification code of each process/operating unit listed in Part 1 (omit combustion units specifically used for process or space heating, boilers, etc.)

SECTION IV. PROCESS/OPERATING DATA (Cont'd)

Complete Items 7 and 8 placing no more than one input and one output on each line. Feed materials and products should be shown on the same line, or on consecutive lines below the line containing the ID code to which they apply. Each new ID code should be shown on the first available line after all feed materials and products have been listed for the previous unit. Specify the units that are common for the industry and if abbreviations are used, define them in the space provided at the bottom of the page.

7. *Process/Operating Unit Inputs* – List each feed material and its throughput on a separate line.

a) Feed Materials: List all feed materials used by the process/operating unit but omit fuels that are not specifically feed materials for products or processes. Fuels that *are* feed materials should be included with other feed materials under process/operating unit inputs.

b) Annual Rate: Give the quantities of feed materials actually used for this process/operating unit during the calendar year of record. Specify the units that are common for the industry.

c) Daily Process Rate: List the designated feed rates using identical units for each category and specify the units used.

Normal – daily feed rate under normal use of the year of record.
Maximum – maximum daily feed rate attained during the calendar year of record

Note: The daily Process Rate must be completed only if the feed material is a solvent or contains solvent. For all other feed materials, this item may be omitted.

d) Hourly Process Rate: List the designated hourly feed rates using identical units for each category and specify the units used.

Design – hourly feed rate as specified by the manufacturer
Normal – hourly feed rate under normal use for the year of record
Maximum – maximum hourly feed rate attained during the calendar year of record

e) Reid Vapor Pressure (RVP): Enter the RVP or the true vapor pressure of the stored material in psia at 100°F. If not readily available enter the vapor pressure in psia and specify corresponding temperature (e.g., 3.5 @ 70°F). This item is not to be used in relation to storage of solid materials, and should *only* be completed for feed materials containing organic liquid.

8. *Process/Operating Unit Outputs*

a) Products: List all products of the specified process/operating unit. Use one line for each product.

b) Annual Rate: Enter actual quantity produced by the process/operating unit during the calendar year of record under amount and specify the appropriate units.

c) Hourly Process Rate: Enter the designated hourly production rates using identical units of measure for each category and specify units.

Design – product rate as specified by the manufacturer
Normal – normal production rate for the calendar year of record
Maximum – maximum production rate during calendar year of record

Part 3. Fuel Usage Information

Part 3 requests information concerning fuel usage of combustion units.

1. Internal ID Code of Process/Operating Unit – Enter the internal ID code of combustion units from Section III.1 or Section IV, Part 1.1. Use one line for each fuel type burned in the unit.

9. *Size of Combustion Unit* – Enter the maximum rated capacity for the combustion unit in millions (10^6) BTU/hour. If the maximum rated capacity is only known in boiler horsepower, brake horsepower or pounds of steam per hour, convert to BTU/hour as follows:

   - Multiply the boiler horsepower by 33.5×10^3
   - Multiply the brake horsepower by 25.5×10^2
   - Multiply the pounds of steam per hour by the heat content of the steam in BTUs/lb and divide by the boiler efficiency. If either the heat content of the steam or the boiler efficiency are known, specify the quantities that are known by placing a letter after the value of the item as follows:

     For pounds of steam per hour, use "S," e.g., .1 - S, in 10^6 lbs steam per hour;

     For heat content of the steam, use "H," e.g., 1150-H in BTU/lb; and

     For boiler efficiency, use "B," e.g., 60% - B.

   Note: This item is not applicable for direct heat transfer units.

10. *Fuel*

   a) Type: Specify the type of fuel burned in the combustion unit. If more than one fuel is burned, list each fuel on a separate line on the form and provide all the data requested. If solvent is added to the fuel, be certain to include the solvent in this item. Typical examples of fuels include:

      - anthracite coal, bituminous coal, lignite
      - coke
      - LPG: butane, propane
      - natural gas
      - process gas
      - wood, bark, sludge
      - fuel oil and number (e.g., fuel oil #2)
      - gasoline

For items b, c, d and e, if any of these values are unknown, obtain the necessary data from your fuel supplier.

   b) Heat Content: Enter the heat content of the fuel in BTU per fuel unit, where the fuel unit is specified in Item 11B, Amount of Fuel Used – Hourly. (Average value for calendar year of record.)

   c) Percent Sulfur: Provide the average percent of sulfur by weight in the fuel used during the calendar year of record; and indicate the highest percentage of sulfur by weight in the fuel used for the year.

   d) Percent Lead: Furnish the average percent of lead by weight in the fuel used during the calendar year of record; and indicate the highest percentage of lead by weight in the fuel used for the year.

SECTION IV. PROCESS/OPERATING DATA (Cont'd)

e) Percent Ash: Enter the average percent ash by weight in the fuel used during the calendar year of record.

11. *Amount of Fuel Used*

a) Annual: Provide the amount of fuel using during the year and specify the units of measure. Recommended units include tons for solid fuels, thousand (10^3) gallons for liquid fuels, and thousand (10^3) cubic feet for gaseous fuels.

b) Hourly Rate: Enter the hourly fuel consumption rate using identical units for the three designated entries.

Design - consumption rate as designed
Normal - normal consumption rate
Maximum - maximum rate of fuel use during the year

Specify the units used. Recommended units include pounds for solid fuels, gallons for liquid fuels and cubic feet for gaseous fuels.

12. *Normal Percent Excess Air Used* - Enter the normal percentage of air in the combustion unit in excess of that required for complete combustion of the fuel. Use the space at the bottom of the form to define any unit abbreviations used.

13. *Fuel Seasonal Throughput (%)* - Enter the annual percent of fuel burned during each quarter of the year on a seasonal basis. "December" in ITEM 13a refers to the year prior to the "CALENDAR YEAR OF RECORD" listed in SECTION I, ITEM 13.

a) December-February (Winter)
b) March-May (Spring)
c) June-August (Summer)
d) September-November (Fall)

SECTION V. EMISSIONS DATA

This section identifies sources of emissions to the atmosphere and describes the pollutants and the quantities of their respective emissions. No stack test should be expressly conducted in order to complete this section of the form, and guessing is not a valid emission estimation method.

1. *Internal ID Code of Estimation Point* - List *all* the ID codes of units for which emission estimates are available. These should include process/operating units, air cleaning devices and stacks and vents.

2. *Location of Emission Estimation Point* - Identify the location at which the emission estimate is being made. Provide information for all emission points for which data is available. Possible responses for this item include:

SECTION V. EMISSIONS DATA (Cont'd)

1– Stack
2– Vent
3– Fugitive
4– Immediately after the process/operating unit (prior to combination with other units)
5– Immediately after the control device

Enter either the indicated number or the appropriate term.

3. *Pollutant* For the unit identified in Section V.1 and Section V.2 above, list each pollutant for which emission estimates are available on a separate line. For hydrocarbons, specify the chemical name such as methane, butane, benzene, if known, and enter each on a separate line.

4. *Estimation Method* Specify the method used to make the emission estimate for each pollutant. Possible responses include:

1– Stack Test
2– Material Balance
3– EPA Emission Factor
4– Other Emission Factor (Specify)
5– Other (Specify)

Enter either the indicated number or the appropriate term.

5. *Emissions* Enter the quantity of emissions attributed to the measurement point. For process/operating units this quantity refers to the level of emissions in the absence of controls; for air cleaning devices the quantity refers to the level of emissions after the control procedure has been completed; and for stacks and vents, the measurement is considered to be at a point just prior to the emissions entering the atmosphere.

a) Annual: Enter the total emissions in tons of the pollutant for the calendar year of record.

b) Hourly: Enter the normal and maximum emission rates in pounds per hour for each pollutant for the year.

6. *Source Test Data* Complete this item *only* if the box in the heading contains a check mark and a physical test was performed at the emissions estimation point indicated in item 2.

a) Date of Last Test: Enter date when the last emissions test was conducted.

b) Method Used: Describe the analytical procedure used to obtain the results. These methods may be denoted by an acronym and a number such as: EPA Method #5. If any other test method was used, specify all pertinent data.

c) Percent Operating Capacity: Enter the percent of design product-throughput at the time of the test.

Supply copies of records for all source tests performed in the last (3) years. No source tests should be conducted specifically for this report.

SECTION VI. AIR CLEANING EQUIPMENT

Information concerning each item of air cleaning equipment whose internal ID code should have been listed in Section III.2 is requested in this section.

1. *Internal ID Code of Control Equipment* – Enter ID code of each item of control equipment.

2. *Air Cleaning Equipment*

   a) Type: Specify type of control equipment such as:

   - single cyclone
   - mechanical, centrifugal separator
   - spray chamber, venturi scrubber
   - baghouse
   - electrostatic precipitators (single or two-stage)
   - afterburners
   - condensers
   - absorbers, adsorbers, scrubbers
   - direct flame incinerators

   b) Normal Hrs/Week: Enter the hours of operation of the equipment during a normal operating week.

   c) Normal Hrs/Day: Enter the hours of operation of the equipment on a normal operating day.

5. *Pollutant Removed* – List the specific pollutants removed including the chemical names for all hydrocarbons where available. If more than one pollutant is affected use an additional line for each pollutant. The following pollutant abbreviations may be used:

   SO_x = Oxides of Sulfur
   NO_x = Oxides of Nitrogen
   PART = Particulates
   CO = Carbon Monoxide
   THC = Total Hydrocarbons
   Other (Specify)

6. *% Collection Efficiency* – Enter the efficiency of pollutant collection in percent by weight.

   a) Design: Enter design efficiency of the unit for the pollutant.

   b) Actual: Enter the actual efficiency attained during the year of record.

7. *Inlet Gas Temperature* (^{o}F) – Enter the normal temperature of the gas entering the air cleaning device in ^{o}F.

8. *Inlet Gas Flow Rate* – Enter the normal volumetric flow of the gas entering the air cleaning device in actual cubic feet per minute (acfm).

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SECTION VI. AIR CLEANING EQUIPMENT (Cont'd)

9. *Inlet Gas Pressure* – Enter the normal pressure of the gas at the inlet to the air cleaner in pounds per square inch absolute.

10. *Pressure Drop* – Enter the pressure drop through the air cleaning device.

    a) Design: Provide the design pressure drop in pounds per square inch (psi).

    b) Actual: Enter the average actual pressure drop in psi.

SECTION VII. STACK AND VENT DATA

Section VII requests information concerning the points of emission to the atmosphere.

1. *Internal ID Codes of Stack or Vent* – Enter ID codes of stacks and vents as shown in Section III.3. No stack or vent should be listed more than one time.

2. *Inside Configuration at Top of Stack*

    a) Shape: Give the shape of the cross-sectional flow path of the gas at the exit of the stack or vent (round, square, rectangular, elliptical, irregular, etc.).

    b) Cross-Section Area: Enter in square feet the cross-sectional flow area at the exit point of the stack or vent.

3. *Height of Top Above Grade* – Enter the height of the stack/vent opening as measured in feet in relation to ground level.

Note: Items 4, 5, 6 and 7 should reflect conditions at the exit point from each stack or vent.

4. *Exit Gas Temperature* – Specify the temperature of the exhaust gases in ^{o}F.

5. *Exit Gas Flow Rate* – Provide the volumetric flow rate of the exhaust gases at the exit gas temperature given in VII.4.

    a) Normal: Enter the normal gas flow rate in actual cubic feet per minute (acfm).

    b) Maximum: Enter the maximum gas flow rate in acfm.

6. *Normal Exit Gas Velocity* – Enter the exhaust gas velocity in feet/second. This can be calculated as follows:

$$\frac{\text{Normal Exit Gas Flow Rate in acfm (Item 5a)}}{\text{Cross-Sectional Area of Stack Mouth in ft}^2\text{ (Item 2b)} \times 60\ \frac{\text{sec}}{\text{min}}}$$

= Normal Exit Gas Velocity in ft/sec.

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SECTION VII. STACK AND VENT DATA (Cont'd)

7. *Exit Gas Components* – Enter information concerning the exhaust gas as listed:

   a) Heat Content: Enter the heat content of the exhaust gas in BTU per standard cubic feet (14.7 psia and 68°F).

   b) % CO_2 Content: Enter the percent of carbon dioxide in the exhaust gas by volume.

   c) % Oxygen Content: Enter the percent of oxygen in the exhaust gas by volume.

   d) % Moisture Content: Enter the percent of water vapor in the exhaust gas by volume.

8. *Number of Sampling Ports* – Specify the number of sampling ports in the stack or vent.

SECTION VIII. STORAGE TANK DATA

This section identifies storage facilities for petroleum based products and describes their characteristics, associated control equipment, the product being stored and the resulting emissions.

1. *Internal ID Code for Storage Tank Unit* – List the internal ID code for all storage facilities used to hold organic liquid products such as fuels and solvents.

2. *Operational Dates*

   a) Construction Began: Indicate the month, day and year that a contract was signed to undertake and complete a continuous program of construction or modification to the storage tank unit; or the month, day and year that work actually began if no contract was signed.

   b) In-Service: List the month, day and year that the storage tank unit began operations.

3. *Tank Measurements*

   a) Capacity: Specify the capacity of the tank in units of thousands of barrels (10^3 bbls). Enter 100 for a tank with a capacity of 100,000 barrels.

   b) Throughput: Indicate the annual throughput of the tank in thousands of barrels per year (10^3 bbls/yr) for the specified year. Enter 2,000 for a tank with a throughput of 2,000,000 barrels per year.

   c) Diameter: Provide the diameter of the tank in feet.

   d) Height: Enter the height of the tank in feet.

   e) Vapor Space Height: Indicate the vapor space height in feet. The vapor space height is that distance between the normal or average level of the liquid product being stored and

the fixed roof of the tank. An adjustment is required for cone-shaped roofs. First, calculate the distance between the normal or average level of the liquid and the base of the cone. Second, determine the height of the cone section alone and divide this amount by three. Finally, add these two values together to yield the vapor space height.

4. *Control Equipment* – Provide the information requested pertaining to the control equipment connected to the indicated storage tank unit.

   a) Internal ID Number: Supply the internal ID code numbers for the control equipment units connected to this storage tank.

   b) Brand Name and Model Number: Enter the brand name and model number of all control equipment units.

   c) Type: Specify the type of control equipment used by entering the number associated with each item as follows:

      1 – Absorption
      2 – Refrigeration
      3 – Variable Vapor Space
      4 – Fixed With Gas Blanket
      5 – Incineration
      6 – Other (Specify)

   d) Percent Control Efficiency: Enter the efficiency of total hydrocarbon collection in percent by weight.

      Design – Supply the design efficiency of the unit.
      Actual – Indicate the actual efficiency attained during the Calendar Year of Record.

   e) Vent: Identify whether the control equipment unit is vented to the atmosphere or an incinerator as follows:

      ATM – atmosphere
      INC – incinerator

5. *Tank Characteristics* – Several characteristics for each storage tank unit have been requested on the form. For characteristics a, b, c, d, e, f and i, several alternatives have been provided. Please fill in the appropriate spaces on the form with the characters or numbers representing the most representative choice available. If another response is more desirable, enter it or an abbreviation in the space provided. When the latter is used, define the abbreviation in the space at the bottom of the page.

   a) Location:

      ABV – above ground
      UND – undergound

SECTION VIII. STORAGE TANK DATA (Cont'd)

b) Fill Method:

SUB – submerged
SPL – splash
BLD – bottom loading

c) Roof Type:

1 – fixed
2 – floating pan
3 – floating pontoon
4 – floating double deck
5 – variable vapor space
6 – pressurized

d) Seal Type:

S – single
D – double

e) Seal Condition:

T – tight
L – loose

f) Shell Construction:

RIV – riveted
WELD – welded
GUN – gunite
EPOX – epoxy coated rivets

g) Roof Color: Supply the color of the tank roof.

h) Shell Color: Furnish the color of the tank excluding the roof area.

i) Paint Condition:

G – good
P – poor

6. *Product Stored* – Identify the common name of the product stored in the tank. If unknown, use the chemical name.

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SECTION VIII. STORAGE TANK DATA (Cont'd)

7. *Product Characteristics* --

a) Density: Supply the density of the product vapors when converted from liquid to vapors in pounds per gallon (lbs/gal).

b) Vapor Molecular Weight: Provide the molecular weight of the product vapors in pounds per mole (lbs/mole).

c) Reid Vapor Pressure (RVP): Enter the RVP or true vapor pressure of the stored material in psia at 100°F. If not readily available, enter the vapor pressure in psia and specify the corresponding temperature (e.g., 3.5 @ 70°F). This item is not to be used in relation to storage of solid materials.

d) Storage Temperature: Indicate the temperature -- which the product is stored.

Normal -- normal or average storage temperature of the product
Maximum -- maximum storage temperature of the product

8. *Tank Emissions (if known)*

a) Amount: Provide the estimated tank emissions in lbs/hour from the storage tank unit.

Normal -- Indicate the normal or average hourly emissions.
Maximum -- List the maximum emission rate observed during the Calendar Year of Record in lbs/hour.

b) Estimation Method: Denote the method used to determine the emissions by entering one of the following choices or the associated number in the appropriate space.

1-- Source Test
2-- Material Balance
3-- EPA Emission Factor
4-- Other Emission Factor (Specify)
5-- Other (Specify)

SECTION IX. SOLVENT USAGE INFORMATION

If solvents, or substances that contain solvents, are used as feed materials by a process/operating unit, then this page of the form must be completed to identify their use.

This section of the form has been designed in two semi-independent parts. The first part requests information pertaining to the solvent composition of feed materials, while the second part asks the user to indicate the amount of solvent recovered and disposed. Each part can be completed independently.

1. *Feed Material* List all feed materials that either contain solvent or are solvent.

SECTION IX. SOLVENT USAGE INFORMATION (Cont'd)

2. *Heat Used* – Indicate by either "Yes" or "No" whether or not this feed material comes into contact with a flame, or is baked, heat cured or heat polymerized.

3. *Common Name of Solvent* – List the common name of all solvents in the feed material identified above in 1.

4. *Chemical Composition of Solvent* – For each solvent listed, provide the chemical composition.

5. *Solvent as Percent of Feed Material*

   a) By Volume: Specify, by volume, the listed solvent as a percentage of the indicated feed material.

   b) By Weight: Specify, by weight, the listed solvent as a percentage of the indicated feed material.

1. *Feed Material* – Repeat the feed materials mentioned in the left most column on this page. The same feed material need not be included on the same line.

6. *Internal ID Code of Process/Operating Unit Using Listed Feed Material as Input* – List the internal ID codes of all process/operating units using the indicated feed material as input. If there are many process/operating units using a particular feed material, list the ID code of each unit.

Note: For items 7, 8, and 9, if more than one recovery or disposal method applies, feel free to use more than one line.

7. *Solvent Recovered*

   a) Amount: Provide the average amount of total solvent recovered. Recovered solvent includes that amount that is recycled.

      - By volume in gallons per day (gal/day)
      - By weight in pounds per day (lbs/day)

   b) Method: Indicate the method used to recover the solvent. Enter either the number or an abbreviated term from the following alternatives:

      1 - Absorption
      2 - Adsorpotion
      3 - Condensation
      4 - Distillation
      5 - Recycling (amount of solvent automatically returned to the system)
      6 - Other (Specify)

8. *Disposal of Solvent*

   a) Amount: Provide the average amount of total recovered solvent disposed of in gallons per day (gal/day).

SECTION IX. SOLVENT USAGE INFORMATION (Cont'd)

b) Method: Denote the method used to dispose of the solvent. Enter either the number or an abbreviated term from the following alternatives:

1– On Site Dumping
2– Evaporation
3– Incineration
4– Off Site Removal
5– Container Storage
6– Discharge into a Sanitary System
7– Other (Specify)

9. *Disposal of Feed Material*

a) Amount: Provide the average amount of the indicated feed material containing solvent disposed of in gallons per day (gal/day).

b) Method: Denote the method used to dispose of the solvent. Enter either the number or an abbreviated term from the following alternatives:

1– On Site Dumping
2– Evaporation
3– Incineration
4– Off Site Removal
5– Container Storage
6– Discharge into a Sanitary System
7– Other (Specify)

SOLVENT MANUFACTURER OR SUPPLIER

On a separate sheet of paper, list the name and address of the manufacturer or supplier of each solvent used. This list should be submitted with this section of the APER.

APPENDIX B

SUPPLEMENTAL INSTRUCTIONS TO THE APER FORM

EPA Form 3520-4A (9-78)

INDUSTRY GROUPINGS FOR APER SPECIFIC INSTRUCTIONS

1. **CHEMICAL PRODUCTS/PROCESSES**

   Industrial Chemicals
   Plastic Materials and Synthetics
   Drugs
   Soap, Cleaners, Toilet Goods
   Paints, Varnishes and Allied Products
   Gum and Wood Chemicals
   Agricultural Chemicals (Fertilizers, Acids)
   Miscellaneous Chemicals (Explosives, Charcoal, etc.)

2. **FOOD AND AGRICULTURAL PRODUCTS/PROCESSES**

   Dairy
   Meat Handling
   Fish Processing
   Grain and Fermentation (Grain elevators)
   Sugar
   Tobacco
   Agricultural and Open Burning
   Roasting
   Cotton Ginning
   Miscellaneous

3. **METAL INDUSTRY**

   Steel Production
   Smelters
   Non-Ferrous Metals
   Aluminum
   Coke
   Metal reprocessing
   Electroplating

4. **MINERAL PRODUCTS**

   Glass, Frit, Fiberglass
   Clay and Refractories
   Mining
   Concrete, Gypsum
   Asbestos, Asphalt
   Misc. Non-Metals

5. **LUMBER AND WOOD PRODUCTS**

   Sawmills, Planing Mills
   Lumber Products (Plywood, Furniture)
   Wood Preserving
   Miscellaneous

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6. **PAPER PROCESSING**

Pulp Mills, Paper Mills
Pulpboards
Paper Manufacturing

7. **MISCELLANEOUS SOFT GOODS MANUFACTURING**

Textile Mill
Apparel
Leathergoods
Rubber and Plastic Products
Converted Paper Products

8. **PRIMARY EVAPORATIVE SOURCE**

Drycleaning, Degreasing
Petroleum Products Handling
Printing and Publishing
Painting, Surface Coating
Miscellaneous

9. **HARDWARE FABRICATION/MANUFACTURING**

Fabricated Metal Products
Machinery
Electrical Equipment and Supplies
Transportation Equipment
Instruments and Related Products
Ordinance and Accessories

10. **PETROLEUM REFINING/NATURAL GAS PROCESSING**

11. **COMBUSTION SOURCES**

Power Plants
Hospitals

12. **SOLID WASTE DISPOSAL**

Incinerators
Dumps
Automotive
Sewage Sludge

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PETROLEUM REFINING/NATURAL GAS PROCESSING/OIL & SOLVENT RE-REFINING
(Supplemental Instructions)

These supplemental instructions provide industry related examples for certain items of the Air Pollutant Emissions Report (APER). Although not intended to be all inclusive of the industry covered, the examples are directed towards industries related to yours and should be helpful in the completion of the APER.

TYPICAL DESCRIPTIONS OF MAJOR ACTIVITIES (Section II, Item 1)

- crude oil distillation (atmospheric & vacuum)
- deasphalting
- alkylation
- isomerization
- thermal cracking
- coking processes (delayed & fluid)
- catalytic cracking (fluid bed & moving bed)
- asphalt production
- sulfur recovery
- sulfuric acid manufacture
- acid gas treating (MEA and DEA absorbents)
- hydrotreating (hydrodesulfurization)
- reforming
- hydrocracking
- hydrogen production
- sweetening (merox)
- light ends recovery (LPG)
- waste water treating
- clay filtering
- blowdown recovery
- storage tank farms
- marketing activities
- cooling towers
- steam generation

TYPICAL DESCRIPTIONS OF PROCESS/OPERATING UNITS (Section IV, Part 1, Item 2)

- reactor vessels (distillation columns)
- regenerator vessels (catalyst & clay regeneration, TCC kilns)
- surge hoppers (use for TCC's)
- process heaters (include CO boilers)
- incinerators
- pumps
- compressors
- flares (only associated with "blowdown recovery")
- loading equipment (only associated with "marketing activities")
- process drains (only associated with "waste water treating")
- oil-water separators (only associated with "waste water treating")
- sour water strippers (only associated with "waste water treating")
- sludge disposal equipment (only associated with "waste water treating")
- vacuum jets
- hydrocarbon storage tanks (only associated with "storage tank farms")
- emulsifiers (only associated with "asphalt production")
- oxidizers (only associated with "asphalt production")
- solid material storage (use for coke piles, catalyst & clay storage)
- solid material conveyers

SPECIAL NOTES

- "Crude Oil Distillation" (Major Activity)

  1) Section II, Item 4 In Major Activity Products, do not include atmospherically distilled fractions which are fed to vacuum distillation columns.

  2) Section IV List each distillation column as a process/operating unit. All feed materials and products should be listed for each column in Part 2.

- "Fluid Catalytic Cracking" (Major Activity)

  1) Section IV, Part 1 List reactor and regenerator vessels as separate process/operating units.

  2) Section IV, Part 2 Feed material for the reactor should reflect fresh oil feed while feed material for the regenerator should be recirculated catalyst.

  3) Section VI Cyclones which are contained within the regenerator vessel should be listed as "internal" or "process" cyclones. External control devices should be listed separately.

- "Marketing Activities" (Major Activity)

  1) Section IV For each loading apparatus, show the Reid Vapor Pressure of the loaded material in Part 1, Item 5C.

  2) Section VI For each loading apparatus, show the loading technique (submerged fill, bottom loading, splash loading) "Type of Air Cleaning Equipment", Item 2b.

- "Sulfur Recovery" (Major Activity)

  1) Section II, Item 4 The major activity product for this category should be the total product sulfur from the Claus and tail gas clean up units.

  2) Section III Tail gas clean up systems should be treated as air cleaning equipment for the purposes of this form, and their relationship to the Claus process equipment should be shown in this section.

  3) Section IV, Part 1 All process/operating units in the sulfur recovery system should be listed, starting with the acid gas burner and including the Claus catalytic reactors, incinerators, and any associated process combustion units.

  4) Section V Emission data need only be provided for the final emission point of the system (i.e., the tail gas incinerator or the tail gas clean up unit vent) and associated process heaters.

  5) Section VI Data related to a tail gas clean up system should be shown in this section.

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- "Pumps and Compressors" (Process/Operating Units)

  1) Section IV - For each pump and compressor, show the Reid Vapor Pressure of the material handled in Part 1, Item 7e.

  2) Section VI - For each pump or compressor, show the type of seal used under "Type of Air Cleaning Equipment," Item 2a.

- "Oil-Water Separators" (Process/Operating Units)

  1) Section IV- For each oil-water separator, show the Reid Vapor Pressure of the waste water stream in Part 1, Item 7e.

  2) Section VI - For each oil-water separator, show the type of cover used under "Type of Air Cleaning Equipment," Item 2a.

- "Flares" (Process/Operating Units)

  1) Section IV - For emergency flares, show waste gas feed rates in Item 7. (No data need be shown for outputs in Item 8.) Also, include pilot flame fuels in Items 10 and 11 of Section IV. For continuously operated flares, show the waste gas feed rates in Items 10 and 11. The total sulfur content of the feed to the flare should be shown in Item 10c for both emergency and continuous flares.

CHEMICAL PRODUCTS/PROCESSES
(Supplemental Instructions)

These supplemental instructions provide industry related examples for certain items of the Air Pollutant Emissions Report (APER). Although not intended to be all inclusive of the industry covered, the examples are directed towards industries related to yours and should be helpful in the completion of the APER.

DESCRIPTION OF MAJOR ACTIVITIES (Section II, Item 1)

- alkylation
- amination
- cracking
- dehydration
- esterification
- halogenation
- hydrolysis
- hydrogenation
- dehydrogenation
- nitration
- oxidation
- polymerization

DESCRIPTION OF PROCESS/OPERATING UNIT (Section IV, Item 2)

Examples of inputs are:

- conveyor, hopper etc. (raw feed handling)
- weigher, mixer, grinder, dryer (physical processes)
- open kettle, tank, pot (open reaction vessels)
- converters, regenerators, partial oxidizers (reactors)
- incinerator, pyrolizer, cooker, kiln, cooler
- separator (specify)
- electrolytic cells
- packager, specify other product handlers
- storage tanks, bins, piles

FEED MATERIALS (Section IV, Item 7)

Feed materials can include:

- hydrogen, chlorine, carbon dioxide
- sulfuric, nitric, fatty acids
- wood waste, hydrocarbons, coke
- phenol, formaldehyde, vinyl chloride, styrene
- brine, ores
- miscellaneous chemicals (specify)
- fuels (specify) which are sources of products

PRODUCTS (Section IV, Item 8)

Product examples include:

- end product chemicals (specify)
- polymers, resins, synthetics (specify)
- paints, varnish, ink, pigment, dye
- drugs, soaps, detergents
- acids, fertilizers, pesticides (specify)

UNITS

Enter units normally used for the feed or products and specify. Recommended units are pounds and tons (2000 lbs) for solids, 1000 gallons for liquids and 10^3 or 10^6 standard cubic feed (SCF) for gases. Any non-standard units used (i.e. barrels) must be defined in space at bottom of page 4 in pounds or gallons.

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MISCELLANEOUS EVAPORATIVE SOURCES
(Supplemental Instructions)

These supplemental instructions provide industry related examples for certain items of the Air Pollutant Emissions Report (APER). Although not intended to be all inclusive of the industry covered, the examples are directed towards industries related to yours and should be helpful in the completion of the APER.

For operations involving organic liquid storage or solvent usage, Sections VIII and IX of the APER should also be completed.

DESCRIPTION OF PROCESS/OPERATING UNIT (Section IV, Item 2)

Entries may include:

- solvent dip, rinse, dry (may be separate or combined)
- blender, mixer
- degreaser, cleaner, passivator
- spray bath, flow coater, dip tank, electroplater (surface coat)
- baking, curing, drying units
- liquid handling, transfer
- masking area
- waste disposal

FEED MATERIALS (Section IV, Item 7)

a. Typical feed materials include:

- perchlorethylene, toluene, acetone etc. (solvents/thinners)
- dyes, pigments, resins
- paint, varnish, rubber, metal salts etc. (surface coatings)
- acids, bases (specify etchants)
- chemical composition of solutions used

b. Rates

Specify actual quantity expended for milling, etching, cleaning solutions.

PRODUCTS (Section IV, Item 8)

a. Typical products are:

- cleaned fabrics
- milled, coated products
- paint, varnish, inks etc.

b. Rates

Output rates for large finished products need not be entered i.e., autos, large appliances, furniture)

UNITS

Generally use tons (2000 pounds) for all inputs and outputs including solvents. For liquid transfers use 1000 gal units.

LUMBER AND WOOD PRODUCTS
(Supplemental Instructions)

These supplemental instructions provide industry related examples for certain items of the Air Pollutant Emissions Report (APER). Although not intended to be all inclusive of the industry covered, the examples are directed towards industries related to yours and should be helpful in the completion of the APER.

DESCRIPTION OF PROCESS/OPERATING UNIT (Section IV, Item 2)

- enter *woodworking* if several types of woodworking are being done at one area. If specific procedures are being carried out at specified areas enter actual units: saws, planers, sander, chipper, etc.
- pneumatic conveyor
- open storage
- retort for wood treatment
- veneer assembler and press
- dryer (veneer, lumber, etc.)
- surface coating (spray booth, roller coater, etc.)
- mixing tank, storage tank (specify liquid)
- waste burner, waste handling

FEED MATERIALS (Section IV, Item7)

Typical feed materials include:

- logs, lumber, veneer
- specify type of wood (pine, walnut, etc.)
- specify preservative, resins used (creosote)
- specify surface coating used
- adhesives

PRODUCTS (Section IV, Item 8)

Typical products include:

- lumber (type), plywood, veneers
- boxes, crates
- office furniture
- poles, pilings

UNITS

Units standard for the industry may be used to indicate *feed* and *product* throughputs. Please specify units used and define in pounds or tons in space provided at bottom of page 4. Recommended units are pounds or tons (2000 pounds) for most inputs and gallons for liquid fuels.

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MISCELLANEOUS SOFT GOODS/PRODUCTS
(Supplemental Instructions)

These supplemental instructions provide industry related examples for certain items of the Air Pollutant Emissions Report (APER). Although not intended to be all inclusive of the industry covered, the examples are directed towards industries related to yours and should be helpful in the completion of the APER.

DESCRIPTION OF PROCESS/OPERATING UNIT (Section IV, Item 2)

Only general examples of process/operating units are given for this group of non-specific product oriented industries. Since many of the units are used differently at the different types of facilities represented, please be specific in providing your descriptions.

- hide/skin cleaning, compounding, fiber spinning units
- preservation, bating, tanning units
- chemical treatment of various types (specify)
- heating, curing, drying units
- coating, molding, extruding units
- dyeing, printing, finishing units
- milling, buffing units
- storing, handling of liquids and solids
- waste disposal

FEED MATERIALS (Section IV, Item 7)

Some examples of feed materials are:

- hides, skins, vinyl/plastics, pulp stock, fibers, base polymers, etc. (specify type)
- tire carcass, fabric cord
- chemicals used for treatment (specify)
- solvents, resins, adhesives
- dyes, pigments, lacquers
- curing agents, antitoxidants, etc.

PRODUCT (Section IV, Item 8)

Actual products and byproducts should be included:

- leather, leather goods (types)
- artificial leather, coat fabrics
- gelatin, glue
- apparel, sporting goods, synthetic fibers and films
- finished paper products (cups, wallpaper, disposable fabrics, metallized paper)
- tires
- foams, coatings, sealant, insulation
- laminates, misc. hard plastic products

UNITS

Generally use tons (2000 pounds) processed or tons product. For solvent throughputs 1000 gallons unit is recommended. Units common to the industry may be used. If these units are not in pounds, tons, gallons or cubic feet, please enter conversions to these basic units at bottom of page 4.

POWER PLANTS
(Supplemental Instructions)

These supplemental instructions provide industry related examples for certain items of the Air Pollutant Emissions Report (APER). Although not intended to be all inclusive of the industry covered, the examples are directed towards industries related to yours and should be helpful in the completion of the APER.

DESCRIPTION OF PROCESS/OPERATING UNIT (Section IV, Item 2)

Examples of entries include:

- gas turbine, engine (specify type)
- tangential fired water tube boiler, etc.
- nuclear reactor (type)
- storage tank, storage devices for solids
- coal handling (specify)
- other sources of pollutant generation
- fly ash, waste hadnling and disposal (specify)

SECTION IV, PART 3

1. **PROCESS/OPERATING UNIT** – Enter those combustion units which are used for the generation of power. All non-combustion units should be entered.

7. **INPUTS** – (For power generating equipment only) Enter fuel in item 7a. Use one line for each fuel burned and omit 7b and 7c since these items will be covered in Part 3 for fuels.

8. **OUTPUTS** (For power generating equipment only) – Enter power as product and output rate in megawatts or kilowatts. Specify units.

UNITS

For Feed and Products other than power, define all special units used (barrels, etc.) in pounds, tons (2000 pounds), gallons or cubic feet and give conversions at bottom of page 4.

SOLID WASTE DISPOSAL/RECLAMATION
(Supplemental Instructions)

These supplemental instructions provide industry related examples for certain items of the Air Pollutant Emissions Report (APER). Although not intended to be all inclusive of the industry covered, the examples are directed towards industries related to yours and should be helpful in the completion of the APER.

DESCRIPTION OF PROCESS/OPERATING UNIT (Section IV, Item 2)

Enter a brief and specific description of the incineration/combustion unit used for solid waste disposal. Also include waste handling methods which may potentially give rise to emissions.

- multiple chamber incinerator, single chamber incinerator
- pathological, trench, sludge, conical incinerator
- wood waste boiler (specify with or without flyash reinjection)
- reclamation incinerator (specify type)
- open burning (wood, refuse)
- municipal incinerator

SEASONAL THROUGHPUT (%) (Section IV, Item 6)

Enter in percent, for each season, the annual throughput of waste processed by the specified disposal/reclamation method.

FEED MATERIALS (Section IV, Item 7a)

Do not enter waste used strictly as fuel for process or space heating. Inputs will be requested in Section IV, Part 3 -- Fuel Usage.

Enter description, and mix of waste handled:

- industrial waste (specify)
- refuse, garbage, rubbish, trash
- auto parts, electrical equipment, wires
- pathological samples, animals
- sewage, sludge

PRODUCTS (Section IV, Item 8)

Products of waste handling can include:

- unburned salvage (drums, metals, wires)
- soil conditioners
- if no useful product specify *none*

UNITS

Specify units where indicated. For most waste and waste products use pounds or tons (2000 pounds).

FUEL USAGE INFORMATION (Section IV, Part 3)

If a waste material is used strictly as fuel (i.e. wood chips), complete this section for the waste material and process/operating unit. Also, complete for auxiliary fuels.

MINERAL PRODUCTS
(Supplemental Instructions)

These supplemental instructions provide industry related examples for certain items of the Air Pollutant Emissions Report (APER). Although not intended to be all inclusive of the industry covered, the examples are directed towards industries related to yours and should be helpful in the completion of the APER.

DESCRIPTION OF PROCESS/OPERATING UNIT (Section IV, Item 2)

Examples include:

- surface mine, quarry, excavator (collection)
- conveyor, hopper (handling)
- crusher, grinder, blender, size (physical process)
- dryer, smelter, calciner, melter, kiln, oven
- furnaces (reverberatory, induction, rotary)
- blow chamber, cooler
- storage tanks, bins, piles, silo
- sprayer, saturation tanks
- packager, pelletizer, fiber former

FEED MATERIALS (Section IV, Item 7)

Feed materials examples are:

- stone, gravel, clay
- coal, coke, lignite, shale
- alumina, magnesia, silica, zirconia
- lime, basic mixed ores, minerals
- borosilicate, cement, gypsum
- materials in storage

PRODUCTS (Section IV, Item 8)

Products may include:

- asphalt, asphalt roofing
- calcium carbide, cement, ceramics, clay
- glass, fiberglass, mineral wool, frit
- gypsum, lime, perlite, brick
- cleaned coal
- magnesium carbonate, calcium borate, etc.

UNITS

Units common to the industry may be used to indicated feed and product throughputs (i.e. cubic yard of concrete, barrels of cement). Please specify units used and define in space at bottom of page 4 (i.e. cement barrel = 376 lb).

Use pounds or tons (2000 pounds) whenever possible. Also, gallons for liquids and 1000 cubic feet for gases can be used.

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METALLURGICAL INDUSTRY
(Supplemental Instructions)

These supplemental instructions provide industry related examples for certain items of the Air Pollutant Emissions Report (APER). Although not intended to be all inclusive of the industry covered, the examples are directed towards industries related to yours and should be helpful in the completion of the APER.

DESCRIPTION OF PROCESS/OPERATING UNIT (Section IV, Item 2)

Examples include:

A. Nonferrous

- Copper
  - Roaster (multi-hearth, fluid bed)
  - Reverberatory furnace
  - Converter
  - Refinery furnace

- Lead
  - Sinter plant (updraft, downdraft)
  - Blast furnace
  - Dross kettles
  - Refinery kettles
  - Retorts
  - Kilns

- Zinc
  - Roaster plant
  - Sinter plant
  - Retorts

- Aluminum
  - Baking furnace
  - Reduction cell (horizontal sodeberg/vertical sodeberg)
  - Sweating furnaces
  - Crucible
  - Reverberatory furnaces

B. Ferrous

- Sinter plant
- Coke oven (type)
- Blast furnaces
- Open hearth furnaces
- Electric arc furnaces
- Basic oxygen furnaces
- Scarfing
- Rolling mills
- Finishing and coating
- Cupula
- Soaking pits

C. **General**

- Material handling
- Mixing
- Crushing
- Sizing
- Bedding

FEED MATERIALS (Section IV, Item 7)

Typical feed materials include:

- ore, scrap, salvage, precipitates, slag
- ferroalloys, coke, pig iron, matte, calcines
- minerals (specify)
- copper, zinc, tin, lead, etc.
- flux (specify)
- sand
- materials in storage

PRODUCTS (Section IV, Item 8)

Typical products include:

- aluminum, magnesium, copper, etc.
- coke
- brass, bronze, steel
- galvanized, tin plate
- pig iron, cast iron, metal ingots, blister copper
- steel (sheet, plate, strip, bar, rod, tube, pipe, structural)
- other specified metal products

UNITS

Units used should be specified. Use pounds or tons (2000 lbs) whenever possible. Additionally, 1000 gallons can be used for liquids and 10^6 or 10^3 standard cubic feet for gases. Other units, if used, should be converted to pounds, tons, gallons or cubic feet. Show conversions at bottom of page.

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FOOD AND AGRICULTURAL PRODUCTS/PROCESSES
(Supplemental Instructions)

These supplemental instructions provide industry related examples for certain items of the Air Pollutant Emissions Report (APER). Although not intended to be all inclusive of the industry covered, the examples are directed towards industries related to yours and should be helpful in the completion of the APER.

DESCRIPTION OF PROCESS/OPERATING UNIT (Section IV, Item 2)

Examples include:

- open field burning (specify crop, weeds, etc.)
- orchard heater
- conveyors, grain elevators, hoppers, bins, piles
- separator, cotton gin, crusher, grinder, mill, blender
- roaster, smoker, renderer, stoner
- cooler, dryer
- incineration, compost, land fill (waste disposal)
- packager, loader
- storage tanks, silos

FEED MATERIAL (Section IV, Item 7)

Feed material examples are:

- farm grown products (specify)
- cotton, grain (specify), coffee beans, sugar cane, tobacco leaves, alfalfa
- fish, meat, poultry (specify)
- materials in storage
- waste material

PRODUCTS (Section IV, Item 8)

Typical products may be:

- canned, preserved products (specify)
- sugar, cotton, cereal, grain oil, coffee, flour, starch
- meal, feed, tobacco
- canned fish, fish oil, type of meat
- lard, tallow
- beer, whiskey, wine

UNITS

Units standard to the industry may be used to indicate feed and product throughput (i.e. bale of cotton, barrels of whiskey). Please specify units used and define in space at bottom of page 4 (i.e. bale = 500 lbs, barrel = 50 gal). Recommended units are pounds or tons (2000 pounds) for solids and gallons for liquid.

WOODPULP PROCESSING
(Supplemental Instructions)

These supplemental instructions provide industry related examples for certain items of the Air Pollutant Emissions Report (APER). Although not intended to be all inclusive of the industry covered, the examples are directed towards industries related to yours and should be helpful in the completion of the APER.

DESCRIPTION OF MAJOR ACTIVITY (Section II, Item 1)

Conversion of wood to pulp (If more than one process exists at a plant, each would be a major activity. Specify processes — kraft, sulfite, neutral sulfite, semi-chemical, etc.)

Manufacture of products from pulp (Each independent series of processes would be listed as a separate major activity)

DESCRIPTION OF PROCESS/OPERATING UNIT (Section IV, Item 2)

Examples of entries include:

- recovery furnace, lime kiln
- smelt dissolving tank
- cooker/digester/blow tank
- evaporator, dryer
- pulp refiner, beater, finisher
- cutter, sander

FEED MATERIALS (Section IV, Item 7)

Typical feed materials include:

- wood chips, cotton rags, textile waste, paper stock
- sodium salts (specify)
- slaked lime
- sulfurous acid
- resins, colors, sizing
- specify solvents used for treatment, de-inking, etc.

PRODUCTS (Section IV, Item 8)

Typical products include:

- pulp
- paperboard, pulpboard, particleboard
- paper

UNITS

You may enter units normally used in the industry for quantities of feed and products and define at bottom of page 4 in pounds or tons. Use pounds, tons (2000 pounds) or gallons when possible. Also, supply the following conversion factors to convert process materials utilized at your facility into equivalent tons of unbleached air-dry kraft pulp.

equivalent tons unbleached air-dry kraft pulp =

pounds reburned lime

pounds dry solids in spent liquor

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APPENDIX C

EXAMPLE AIR POLLUTANT EMISSIONS REPORT

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AIR POLLUTANT EMISSIONS REPORT (APER)

SEE REVERSE SIDE FOR STATEMENT OF CONFIDENTIALITY REGARDING DATA PROVIDED

SECTION I GENERAL INFORMATION

1. FACILITY NAME				
2. FACILITY ADDRESS	STREET NUMBER	CITY	STATE	3. COUNTY
4. MAILING ADDRESS	STREET OR BOX NUMBER	CITY	STATE	ZIP CODE
5. FACILITY CONTACT		6. POSITION		7. TELEPHONE NUMBER
8. PARENT COMPANY NAME				
9. PARENT COMPANY MAILING ADDRESS	STREET OR BOX NUMBER	CITY	STATE	ZIP CODE
10. PARENT COMPANY CONTACT		11. POSITION		12. TELEPHONE NUMBER
13. CALENDAR YEAR OF RECORD	14. LAND AREA IN ACRES	15. ELEVATION ABOVE MEAN SEA LEVEL	16. NUMBER OF EMPLOYEES	17. PRINCIPAL SIC CODE
18. PRINCIPAL PRODUCTS			19. CONSTRUCTION START DATE	20. OPERATION START DATE

21. SKETCHES Provide sketches or diagrams depicting each of the following items for which check marks appear in the associated boxes:
a) ☐ plant or facility location, b) ☐ plant layout, c) ☐ process flow for the entire facility, d) ☐ process flow for each major activity.

22a. Air pollutants of the type indicated in the instructions for this report, i.e., _____ are not emitted at this facility, plant or establishment. Therefore, no other Sections need be completed.

_____ (Signed) _____ (Title)

22b. Air pollutants of the type indicated in the instructions for this report, i.e., _____ are emitted at this facility, plant or establishment. Therefore, other Sections of the report have been completed with the best data representative of the preceding calendar year.

_____ (Signed) _____ (Title)

DO NOT WRITE BELOW THIS LINE - FOR EPA USE ONLY.

DATE SENT	CDS ID	COORDINATES	
		LATITUDE:	LONGITUDE:
DATE RECEIVED	COMPLIANCE STATUS		
		UTM ZONE:	UTM COORDINATES:
NEDS ID	EMISSION CATEGORY	REVIEWER	DATE REVIEWED
AQCR	SIP CODE	REVIEWER	DATE REVIEWED
PRINCIPAL SIC CODE	☐ ACTIVE ☐ INACTIVE	REVIEWER	DATE REVIEWED

This report is required by 42 U.S.C. 7401 et seq. Failure to report can result in an order requiring compliance, or in a civil action for appropriate relief.

If you believe that any of the information required to be submitted persuant to this request is entitled to be treated as confidential, you may assert a claim of business confidentiality, covering all or any part of the information, by placing on *(or attaching to)* the information a cover sheet, stamped or typed legend, or other suitable notice, employing language such as "trade secret," "proprietary," or "company confidential." Allegedly confidential portions of otherwise nonconfidential information should be clearly identified. If you desire confidential treatment only until a certain date or until the occurrence of a certain event, the notice should so state. Information so covered by a claim will be disclosed by EPA only to the extent, and through the procedures, set forth at 40 CFR Part 2, Subpart B *(41 Federal Register 36902, et seq., September 1, 1976.)*

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SECTION II – MAJOR ACTIVITY THROUGHPUTS

1. DESCRIPTION OF MAJOR ACTIVITY				2. CONSTRUCTION START DATE	3. OPERATION START DATE
4. MAJOR ACTIVITY PRODUCT	5. MAXIMUM OPERATING CAPACITY a. ANNUAL	b. HOURLY	4. MAJOR ACTIVITY PRODUCT	5. MAXIMUM OPERATING CAPACITY a. ANNUAL	b. HOURLY

SECTION III – FACILITY INTERRELATIONSHIPS

1. PROCESS/OPERATING UNIT INTERNAL ID CODE	2. AIR CLEANING EQUIPMENT INTERNAL ID CODES		3. INTERNAL ID CODES OF STACKS AND VENTS		
	a. ITEM I	b. ITEM II	a. ITEM I	b. ITEM II	c. ITEM III

The FACILITY INTERRELATIONSHIPS SECTION should be utilized to indicate how process/operating units, air cleaning equipment, and stacks and vents are connected within each major activity in the facility. The columns headed by ITEM I, ITEM II and ITEM III are for listing more than one device in each category and do not have any ordering or preference connotation. The Internal ID Codes listed in Section III should also appear on the sketches submitted for SECTION I, ITEM 21d, Process Flow for each major activity at the facility.

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SECTION IV – PROCESS/OPERATING DATA
PART 1 – GENERAL INFORMATION

1. INTERNAL ID CODE FOR PROCESS/ OPERATING UNIT	2. DESCRIPTION OF PROCESS/OPERATING UNIT	3. SCC (See Below)	4. OPERATIONAL DATES		5. OPERATING SCHEDULE				6. PROCESS SEASONAL THROUGHPUT (%)			
			a. CONSTRUCTION BEGAN	b. IN-SERVICE	a. HRS/ DAY	b. DAYS/ WEEK	c. WKS/ YEAR	d. HRS/ YEAR	a. DEC-FEB	b. MAR-MAY	c. JUN-AUG	d. SEP-NOV

3. SCC – SOURCE CLASSIFICATION
Enter this eight (8) digit code only if it is known with certainty.

4. OPERATIONAL DATES
Provide the appropriate dates only if they fall after August 17, 1971, unless they are specifically requested in the cover letter to this form.

6. SEASONAL THROUGHPUT
"DEC" in ITEM 6a refers to the year prior to the "CALENDAR YEAR OF RECORD" listed in SECTION I, ITEM 13.

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SECTION IV – PROCESS/OPERATING DATA
PART 2 – INPUT/OUTPUT INFORMATION

1. INTERNAL ID CODE FOR PROCESS/ OPERATING UNIT	7. PROCESS/OPERATING INPUTS (See Below)											8. PROCESS/OPERATING UNIT OUTPUTS (See Below)						
	a. FEED MATERIALS	b. ANNUAL RATE		c. DAILY PROCES RATE			d. HOURLY PROCESS RATE				REID VAPOR PRESSURE (See Below)	a. PRODUCTS	b. ANNUAL RATE		c. HOURLY PROCESS RATE			
		Amount	Units	Normal	Maximum	Units	Design	Normal	Maximum	Units			Amount	Units	Design	Normal	Maximum	Units

7a. FEED MATERIALS
Fuels used for combustion only should not be listed under this item. They are to be shown in SECTION IV, Part 3.

7e. REID VAPOR PRESSURE (RVP)
Enter the RVP in lbs/in^2. If the rvp is not available, enter the vapor pressure in psia and specify the corresponding temperature (e.g. 3.5 @ 70° F). This item is not applicable to the storage of solid materials, and it should only be completed for feed materials containing organic liquids.

USE THIS SPACE TO DEFINE THE UNITS USED ABOVE

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FACILITY NAME

SECTION IV – PROCESS/OPERATING DATA
PART 3 – FUEL USAGE INFORMATION

1. INTERNAL ID CODE FOR PROCESS/ OPERATING UNIT	9. SIZE OF COMBUSTION UNIT (See Below) 10^6 BTU/hr	10. FUEL							11. AMOUNT OF FUEL USED						12. NORMAL % EXCESS AIR USED	13. FUEL SEASONAL THROUGHPUT (%)			
		a. TYPE	b. HEAT CONTENT (BTU/fuel unit)	c. % SULFUR		d. % LEAD		e. % ASH	a. ANNUAL		b. HOURLY					a. DEC-FEB	b. MAR-MAY	c. JUN-AUG	d. SEP-NOV
				Avg.	Max.	Avg.	Max.		Amount	Units	Design	Normal	Maximum	Units					

9. SIZE OF COMBUSTION UNIT

Enter Maximum Rated Capacity. This item is not applicable to direct heat transfer units. If the value is not known, see the instructions.

11. USE THIS SPACE TO DEFINE THE UNITS USED ABOVE

13. SEASONAL THROUGHPUT

"DEC" in ITEM 6a refers to the year prior to the "CALENDAR YEAR OF RECORD" listed in SECTION I, ITEM 13.

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SECTION V – EMISSIONS DATA

1. INTERNAL ID CODE FOR ESTIMATION POINT	2. LOCATION OF EMISSION ESTIMATION POINT (See Below)	3. POLLUTANT	4. EMISSION ESTIMATION METHOD (See Below)	5. EMISSIONS			6. SOURCE TEST DATA (See Below) ☐		
				a. ANNUAL (tons)	b. HOURLY (lbs.)		a. DATE OF LAST TEST	b. METHOD USED	c. % OPER CAPACITY
					Normal	Maximum			

2. LOCATION OF EMISSION ESTIMATION POINT

Identify location of point at which estimate of emissions is being made.
Enter: 1 - Stack
2 - Vent
3 - Fugitive
4 - Immediately after process/operating unit (prior to combination with other units)
5 - Immediately after control device

4. EMISSION ESTIMATION METHOD - Method used for determination of emission data.
Enter: 1 - Stack Test
2 - Material Balance
3 - EPA Emission Factor
4 - Other Emission Factor (Specify)
5 - Other (Specify)

6. SOURCE TEST DATA

Supply copies of reports for all source tests performed during the last three (3) years only if the box above contains a check mark.

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SECTION VI – AIR CLEANING EQUIPMENT

1. INTERNAL ID CODE FOR CONTROL EQUIPMENT	2. AIR CLEANING EQUIPMENT		3. DATE EQUIPMENT BEGAN OPERATING	4. OPERATING SCHEDULE			5. POLLUTANT REMOVED	6. PERCENT COLLECTION EFFICIENCY		7. INLET GAS TEMP (°F)	8. INLET GAS FLOW RATE (acfm)	9. INLET GAS PRESSURE (psia)	10. PRESSURE DROP	
	a. TYPE	b. BRAND NAME AND MODEL NO.		a. ACTUAL HRS/YR	b. NORM HRS/ WEEK	c. NORM HRS/ DAY		a. DESIGN	b. ACTUAL				a. DESIGN (psi)	b. ACTUAL (psi)

5. POLLUTANT ABBREVIATIONS

SOX = Oxides of Sulfur
NOX = Oxides of Nitrogen
PART = Particulates
CO = Carbon Monoxide
THC = Total Hyrocarbons
Other (Specify)

List the chemical name for hydrocarbons, when known.

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SECTION VII – STACK AND VENT DATA

1. INTERNAL ID CODE FOR STACK OR VENT	2. INSIDE CONFIGURATION AT TOP OF STACK		3. HEIGHT OF TOP ABOVE GRADE (ft)	4. EXIT GAS TEMP. (°F)	5. EXIT GAS FLOW RATE		6. NORMAL EXIT GAS VELOCITY (ft/sec)	7. EXIT GAS COMPONENTS				8. NO. OF SAMPLING PORTS
	a. SHAPE	b. CROSS-SECTIONAL AREA (ft^2)			a. NORMAL (acfm)	b. MAXIMUM (acfm)		a. HEAT CONTENT (BTU/ft³)	b. % CO_2 CONTENT	c. % OXYGEN CONTENT	d. % MOISTURE CONTENT	

ITEMS 4 THROUGH 7

The responses to these items should consider the conditions at the exit point of each stack or vent.

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SECTION VIII – STORAGE TANK DATA
PART I – TANK DESCRIPTION AND CONTROL INFORMATION

1. INTERNAL ID CODE FOR STORAGE TANK UNIT	2. OPERATIONAL DATES		3. TANK MEASUREMENTS					4. CONTROL EQUIPMENT					
	a. CON STRUCTION BEGAN	b. IN SERVICE	a. CAPACITY (10^3 bbls)	b. THROUGH PUT (10^3 bbls/yr)	c. DIAM (ft)	d. HEIGHT (ft)	e. VAPOR SPACE HT (ft)	a. INTERNAL ID NUMBER	b. BRAND NAME AND MODEL NUMBER	c. TYPE	d. % CONTROL EFF Design	d. % CONTROL EFF Actual	e. VENT

3e. VAPOR SPACE HEIGHT

The vapor space height is that distance between the normal or average level of the liquid product being stored and the fixed roof of the tank. An adjustment is required for cone shaped roofs. First, calculate the distance between the normal or average level of the liquid and the base of the cone. Second, determine the height of the cone section alone and divide this amount by three. Finally, add these two values together to yield the vapor space height.

4c. CONTROL EQUIPMENT TYPE - Method used to control emissions.

Enter: 1 - Absorption
2 - Refrigeration
3 - Variable Vapor Space
4 - Fixed With Gas Blanket
5 - Other (Specify)

4e. CONTROL EQUIPMENT VENT

ATM - atmosphere
INC - incinerator

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SECTION VIII – STORAGE TANK DATA

PART 2 – TANK CHARACTERISTICS, PRODUCT AND EMISSIONS INFORMATION

1. INTERNAL ID CODE FOR STORAGE TANK/UNIT	5. TANK CHARACTERISTICS (See Below)									6. PRODUCT STORED	7. PRODUCT CHARACTERISTICS					8. TANK EMISSIONS (if known)		
	a. LOCATION	b. FILL METH	c. ROOF TYPE	d. SEAL TYPE	e. SEAL COND	f. SHELL CONST	g. ROOF COLOR	h. SHELL COLOR	i. PAINT COND		a. DENSITY (lbs/gal)	b. VAPOR MOLE WT (lbs/mole)	c. REID VAPOR PRESSURE (psia)	d. STORAGE TEMP Normal	Maximum	a. AMOUNT Normal	Maximum	b. ESTIMATION METHOD

9. AVG AMBIENT TEMPERATURE (°F)

10. AVG DIURNAL TEMP CHANGE (°F)

11. AVG WIND VELOCITY (mph)

5. TANK CHARACTERISTICS Enter one of the choices provided, if space permits, or the characters shown to the left of the choice. If another response is more appropriate, enter it or an abbreviation. When the latter is used, define the abbreviation below.

a. LOCATION
ABV above ground
UND underground

b. FILL METH
SUB submerged
SPL splash
BLD bottom loading

c. ROOF TYPE
1 fixed
2 floating pan
3 floating pontoon
4 floating double deck
5 variable vapor space
6 pressurized

d. SEAL TYPE
S single
D double

e. SEAL CONDITION
T tight
L loose (includes pre-1942 seals)

f. SHELL CONSTRUCTION
RIV riveted
WELD welded
GUN gunite
EPOX epoxy coated rivets

i. PAINT CONDITION
G good
P poor

7a. DENSITY
Density of vapors when converted to

8b. EMISSION ESTIMATION METHOD
Method used for determination of emission data.

Enter: 1 - Source Test
2 - Material Balance
3 - EPA Emission Factor
4 - Other Emission Factory (Specify)
5 - Other (Specify)

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SECTION IX – SOLVENT USAGE INFORMATION

1. FEED MATERIAL	2. HEAT USED (See Below)	3. COMMON NAME OF SOLVENT	4. CHEMICAL COMPOSITION OF SOLVENT	5. SOLVENT AS % OF FEED	
				a. BY VOL	b. BY WT

1. FEED MATERIAL	6. INTERNAL ID OF PROC/OPER UNIT USING LISTED FEED MATERIAL AS INPUT	7. SOLVENT RECOVERED (See Below)			8. DISPOSAL OF SOLVENT (See Below)		9. DISPOSAL OF FEED MATERIAL (See Below)	
		a. AMOUNT		b. METHOD	a. AMOUNT (gal/day)	b. DISPOSAL METHOD	a. AMOUNT (gal/day)	b. DISPOSAL METHOD
		BY VOL (gal/day)	BY WT (lbs/day)					

2. HEAT USED

Indicate whether or not heat or a heat process is applied to the feed material by entering either "YES" or "NO."

SOLVENT MANUFACTURER OR SUPPLIER

On a separate sheet of paper, list the name and address of the manufacturer or supplier of each solvent used.

7b. SOLVENT RECOVERY METHOD

Enter: 1 - Absorption, 2 - Adsorption, 3 Condensation, 4 - Distillation, 5 - Recycling, 6 - Other (Specify)

8b. and 9b. SOLVENT DISPOSAL METHOD

Enter: 1 - On Site Dumping, 2 - Evaporation, 3 - Incineration, 4 - Off Site Removal, 5 - Container Storage, 6 - Discharge into a Sanitary System, 7 - Other (Specify)

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APPENDIX D

GRAIN ELEVATOR QUESTIONNAIRE

Emissions Inventory

Data for year _____

OFFICE USE ONLY

SIC _____

Account Number _____

Name _____

Not applicable _____

ELEVATORS - GRAIN PROCESSING - FEED

ELEVATORS: Country ____ Terminal ____ Operating Rate: ____ % of Maximum Operating Schedule: ___ Hrs/Day ___ Days/Wk ___ Wks/Yr

Corn Cleaner: ___ Yes ___ No

Conveying Belts	Number of Transfer Points	Check Type of Dryer
Tunnel		Baffle ___ Column ___
Gallery		Screen ___
Marine		Rack ___

EPN	Grain Type	Operation	No. of Legs	Quantity of Grain (tons)	Control Equipment				Energy Used	
					Type	Eff (%)	Date Installed	Total Cost	Quantity	Units

GRAIN PROCESSING: Operating Rate: ___ % of Maximum Operating Schedule: ___ Hrs/Day ___ Days/Wk ___ Wks/Yr

EPN	Grain Type	Operation	Quantity (tons)	Control Equipment			STACK DATA				
				Type	Eff (%)	Date Installed	Height Above Ground (ft)	Inside Diameter at Exit (ft)	Temp (°F)	Short Stack ?	Velocity (ft/sec)

AUTHORIZING SIGNATURE _____ Name of Contact Representative _____ Telephone (A. C.) _____